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# SCIENTIFIC INFORMATION REPORT

## Physics and Mathematics

(21)

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SCIENTIFIC INFORMATION REPORTPhysics & Mathematics (21)

This is a serialized report consisting of unevaluated information prepared as abstracts, summaries, and translations from recent publications of the Sino-Soviet Bloc countries. It is issued in six series. Of these, four, Biology and Medicine, Electronics and Engineering, Chemistry and Metallurgy, and Physics and Mathematics are issued twice monthly, and the sixth series, Organization and Administration of Soviet Science, is issued every six weeks. Individual items are unclassified unless otherwise indicated.

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## I. PHYSICS

Atomic and Nuclear Physics1. Particle Interaction In Nonlinear Electrodynamics

"Interaction of Particles in Nonlinear Electrodynamics," by V. M. Linkin and N. N. Kolesnikov; Moscow, Vestnik Moskovskogo Universiteta, Seriya III, Fizika, Astronomiya, No 3, 1962, pp 17-26

The interaction of particles is investigated in the general case of nonlinear electrodynamics. It is shown that the interaction of a point particle with an extended one in nonlinear electrodynamics is approximately the same as the interaction of two particles with extended charges and magnetic moments in the linear theory.

2. Experimental Proof of Pion Decay

"Discoveries by Soviet Physicists"; Leningrad, Leningradskaya Pravda, 27 May 62, p 1

A new discovery of Soviet physicists was reported at the 12th meeting of the scientific council of the Joint Institute for Nuclear Research at Dubna. It consists of experimental proof of the existence of a kind of atomic decay which no one had observed earlier. In this rare case, the positive  $\pi^+$ -meson decays into a neutral  $\pi^0$ -meson, a positron and a neutrino. This kind of decay, according to theoretical calculations, occurs 100 millionth as often as the decay of the same particle into a  $\mu$ -meson and a neutrino, which had been observed in experiments.

This rare occurrence of atomic decay had been predicted by Ya. B. Zel'dovich and S. S. Gershteyn, Soviet theoretical physicists. Based on this hypothesis, one of the discoverers of this decay, physicist Yuriy Prokoshkin, together with his colleagues performed a long series of experiments.

### 3. Geometry of Charged Particle Motion

Geometry of the Movement of Charged Particles, by Yu. P. Pyt yev; Moscow, Vestnik Moskovskogo Universiteta, Seriya III, Fizika, Astronomiya, No 3, 1962, pp 30-40

The movement of charged particles in an electromagnetic field is described by the equation

$$\frac{d^2\vec{x}}{dt^2} = \frac{e}{mc} \frac{d\vec{x}}{dt} \vec{H} + \frac{e}{m} \vec{E}$$

Here e is the charge of the particle, m is the mass, c is the speed of light,  $\vec{E}$  and  $\vec{H}$  are the electric and magnetic fields respectively.

This article examines the geometric properties of the motion described by the above equation.

### 4. Examination of Multiple Production Processes

Quantum Field Consideration of Multiple Processes, by B. T. Vav ilov; Moscow, Vestnik Moskovskogo Universiteta, Seriya III, Fizika, Astronomiya, No 3, 1962, pp 46-58

The quantum field approach to the examination of the multiple production of  $\pi$ -mesons is discussed for  $\pi$ -N,  $\gamma$ -N, N-N, and  $\pi$ - $\pi$  collisions. Formulas are obtained for the multiplicity and the angular and energy distribution. There is qualitative agreement between the results of the theory with those of the experiment.

### 5. Function of Particle Distribution in Cascade Shower

Function of Angular Distribution of a Whole Number of Particles Near the Axis of a Cascade Shower, by V. V. Guzhavin; Moscow, Vestnik Moskovskogo Universiteta, Seriya III, Fizika, Astronomiya, No 3, 1962, pp 63-65

An analytical expression is obtained for the function of angular distribution of particles with energy  $E > 0$  near the axis of a cascade shower.

## 6. Synchrocyclotron Particle Motion

"Investigation of Particle Motion in Synchrocyclotron," by A. A. Zhuravlev et al.; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 32, No 8, 1962, pp 905-913

The method of measuring the orbit according to the beam is described as well as the experiments to determine the distortions of an instantaneous orbit caused by the perturbations introduced in separate sections of the electromagnetic.

Experimental and theoretical data are compared.

The resonance method for determining the frequencies of free oscillations is presented and the results of the experiments on the study of the behavior of an electro beam during the various modes of adjusting the accelerator are discussed.

## 7. Slow Neutron Scattering in Antiferromagnetics

"The Theory of Magnetovibrational Scattering of Slow Neutrons in a Uniaxial Antiferromagnetic," by V. N. Kashcheyev, Institute of Physics, Academy of Sciences, Latvian SSR, Riga; Leningrad, Fizika Tverdogo Tela, Vol 4, No 6, 1962, pp 1432-1441

The energy distribution of a single-phonon magnetovibrational scattering of slow neutrons in uniaxial antiferromagnetics is examined. The broadening and the displacement of the maximum of the peaks of this distribution, which are due to the magnon-phonon interaction, are determined.

## 8. Unitary Symmetry of Strong Interactions

"On the Experimental Verification of Unitary Symmetry of Strong Interactions," by V. M. Shekhter, Leningrad Physico-Technical Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 1, 1962, pp 205-215

The possibilities of experimental verification of the unitary symmetry of strong interactions are discussed. For this purpose the relations between the amplitudes of the various processes are established for each of the two possible variants of unitary symmetry.

9. Solution of Dispersion Method Linear Equations

"On the Solution of the Linear Equations of the Dispersion Method in the Two-Particle Approximation," by A. F. Grashin, Institute of Theoretical and Experimental Physics, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 1, 1962, pp 277-286

A method is proposed to solve the linear integral equation which arises when the effect of the nearest singularities is calculated by the dispersion technique (two-meson approximation). It is shown that in this case it is possible to obtain only one solution in the low energy region which does not depend on the behavior of the amplitude under consideration at infinity. This behavior is determined by a number of mass states in the unitary condition (distant singularities). The condition of independence of the behavior in the high-energy region, which is equivalent to the requirement of stability for the disturbance at infinity, is a necessary condition for the solution of the problem, and moreover provides uniqueness of the solution. The ambiguity previously encountered (R. Omnes, Nuove Cim., No 8, 1958, p 316; P. Federbush, M. L. Goldberger, S. B. Treiman, Phys. Rev. No 112, 1958, p 642) is due to an additional family of solutions which are unstable against perturbations at infinity and have no significance in the given problem. The methods proposed by W. R. Frazer and J. R. Fulco (Phys. Rev., No 117, 1960, pp 1603, 1609) and by J. Bowcock, W. N. Cottingham and D. Lurie (Nuovo Cim., No 16, 1960, p 918) to compute the  $\pi\pi$ -interaction are based on the use of unstable solutions and lead in general to erroneous results. A detailed analysis is carried out for the simplest amplitude, the  $\pi$ -meson electromagnetic form factor.

10. Depolarization of Positive Muon in Electric Field

"Depolarization of  $\mu^+$ -Meson in an Electric Field," by Yu. M. Ivanov et al.; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 1, 1962, pp 337-339

The effect of a strong electric field ( $E \sim 10^5$  V/cm) on the depolarization of  $\mu^+$ -mesons arising when  $\pi \rightarrow \mu$ -decay in a photoemulsion is examined. At present it is possible to consider as proven that the depolarization of the stopping  $\mu^+$  meson is explained mainly by the formation of the muonium (the  $\mu^+e^-$  system). This conclusion is derived from experiments on the dependence of the  $\mu^+$  meson polarization on the magnitude of the longitudinal magnetic field (along the direction of the  $\mu$  meson spin) and from a number of papers (Phys. Rev. Lett., No 5, 1960, p 515; idem, p 63) which directly or indirectly indicate the formation of muoniums with the slowing down of the  $\mu^+$  meson.

11. Measurement of Reaction Probability

"Measurement of the Probability of the Reaction  $\mu^- + \text{He}^3 \rightarrow \text{H}^3 + v$ ," by O. A. Zaymidoroga et al., Joint Institute for Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 1, 1962, pp 355-358

The probability of the reaction  $\mu^- + \text{He}^3 \rightarrow \text{He}^3 + v$  was measured to study the symmetry of the interaction of a muon and an electron with a nucleon.

A previously developed method (ZhETF, 41. 1805, 1961) was employed. A diffusion chamber in a magnetic field  $H = 6000$  Oe, filled with  $\text{He}^3$  at 20 atm of pressure, was located in a beam of 217 Mev/c mesons which was extracted from the synchrocyclotron of the Laboratory of Nuclear Problems of the Joint Institute for Nuclear Research. The mesons were slowed down by a copper filter placed in front of the chamber.

12. Energy Spectra of Slow Rb and Cs Ions Scattered by Molybdenum

"On the Energy Spectra of Slow Positive Rb and Cs Ions Scattered by Molybdenum Surface," by V. I. Veksler, Tashkent State University imeni V. I. Lenin; Leningrad Fizika Tverdogo Tela, Vol 4, No 6, 1962, pp 1419-1423

To clarify the mechanism of interaction of atomic particles with the surface of a solid, the energy spectra of  $\text{Rb}^+$  and  $\text{Cs}^+$  ions are investigated with initial energy  $U = 15-250$  ev scattered at an angle of  $120^\circ$  by a molybdenum target ( $T = 1,400-1,450$  deg K).

13. Bremsstrahlung Photon Absorption by LiH

"Absorption of Bremsstrahlung Photons of an Accelerator by LiH", by Yu. N. Ado and V. V. Yelyan, Physics Institute, Academy of Sciences USSR; Moscow, Pribory i Tekhnika Eksperimenta, No 2, 1962, pp 27-28

The absorption of bremsstrahlung photons of a synchrotron was investigated experimentally in lithium hydride (LiH) in the energy range from 12 to 250 Mev. The length of the absorber was 1.06 radiation units. The results obtained are in good agreement with the data which had been calculated and confirm the possibility of using LiH absorbers as filters to suppress the low energy part of the bremsstrahlung spectrum in electron accelerators. The measurements were made on the 280-Mev synchrotron of the Physics Institute, Academy of Sciences USSR.

14. Quadrupole Lenses for Linear Accelerators

"On the Choice of Poles of Quadrupole Lenses," by V. K. Plotnikov, Institute of Theoretical and Experimental Physics, Academy of Sciences USSR; Moscow, Pribory i Tekhnika Eksperimenta, No 2, 1962, pp 29-33

The results of the calculation of nonlinear fields for quadrupole lenses used in linear accelerators and ion conductors are given. Lenses are examined with poles bounded as hyperbolic and plane surfaces.

15. Simple Method Proposed for Measuring Neutron Spectra

"Simple Method to Measure the Total Spectra of Fast Neutrons," by B. D. Kuz'minov; Moscow, Pribory i Tekhnika Eksperimenta, No 2, 1962, pp 34-35

Measuring the total spectra of neutrons, such as those occurring in fast neutron reactors, is very difficult. The methods ( $\text{He}^3$ -counters, Wilson chambers, photonuclear emulsions) which are normally used to obtain the total energy range are time consuming. A simple method is described making it possible to measure the neutron spectra in a beam within a sufficiently wide energy.

16. Sensitivity of Thick-Wall Ionization Calculated

"Absolute Sensitivity of a Thick-Walled Graphite Ionization Chamber for Photons with Energies of up to 260 Mev," by I. N. Usova, Physics Institute, Academy of Sciences USSR; Moscow, Pribory i Tekhnika Eksperimenta, No 2, 1962, pp 36-42

A method which is a refinement of that of M. Lax (Phys. Rev. No 72, 1947, p 61) and B. M. Bolotovskiy (Report, FIAN, 1952) to calculate the absolute sensitivity of a thick-walled graphite chamber is described. The values obtained by the formulas devised are 20% less than those obtained by the formulas of Lax.

17. Neutron-Deuteron Scattering Examined

"Scattering of a Nucleon on the Bound State of Two Others," by V. F. Kharchenko, Khar'kov State University; Kiev, Ukrains'kyy Fizichnyy Zhurnal, Vol 7, No 6, 1962, pp 573-581

The scattering of a neutron on a deuteron is examined on the basis of Faddeev's equations allowing for spins and isotopic spins in the case of central forces. In the case of the total spin of the system  $S = \frac{1}{2}$  the Schroedinger equation is reduced to four integral equations, and in the case of  $S = \frac{3}{2}$  to two integral equations. As an example,

the case is examined when the interaction between nucleons is described by a nonlocal Yamaguchi potential.

18. Investigation of Bound State of Three Nucleons

"On the Problem of the Bound State of Three Nucleons," by V. S. Kharchenko, Khar'kov State University; Kiev, Ukrains'kyy Fizichnyy Zhurnal, Vol 7, No 6, 1962, pp 582-592

The bound state of a system of three nucleons is examined; the interaction between them is described by a nonlocal Yamaguchi potential. Disregarding the spins of nucleons, the Schroedinger equation for the system is reduced to a one-dimensional integral equation. This equation is solved by the iterative method. The binding energy was calculated and the wave function was found for the bound state of the system. If the spins and isotopic spins of nucleons are taken into account, then the Schroedinger equation with a nonlocal Yamaguchi potential is reduced to a system of two one-dimensional integral equations. The solution of this system of equations determines the binding energy of tritium.

19. Deuteron Splitting Under Action of Nuclear Force

"Deuteron Splitting Under the Action of Nuclear Forces," by A. M. Korolyev, B. D. Konstantinov, and V. I. Dycharenko; Kiev, Ukrains'kyy Fizichnyy Zhurnal, Vol 7, No 6, 1962, pp 602-617

The splitting of the deuteron is examined under the action of nuclear forces in the case when the nuclear state is unchanged during deuteron splitting. It is assumed that both the proton and the neutron interact with the nucleus.

The discussion is based on the theory of perturbations. The distortion of the deuteron wave function in the initial state and the wave function of the motion of the center of gravity and the relative motion of the neutron-proton system in the final state are taken into consideration. On the basis of the above assumptions the matrix elements of the transition are calculated and the complete and differential cross sections of the process ( $d$ ,  $np$ ) are found.

20. High-Energy Elastic Scattering Amplitude

"Some Properties of the Amplitude of High-Energy Elastic Scattering," by V. N. Girbov and I. Ya. Pomeranchuk, Institute of Theroetical and Experimental Physics, Academy of Sciences, USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 1, 1962, pp 308-318

It is shown that the imaginary part of the scattering amplitude  $A_1(s,t)$  in the channel where  $s$  is the energy in the nonphysical region of transferred momenta  $t > 0$ , is positive and has all derivatives with respect to  $t$  which are greater than zero up to the first singularity defined by the Lauda curve  $t = t_0(s)$ . It follows from here in this  $t$  interval that  $dl/dt > 0$  for the Regge pole with the largest  $\text{Re } l$ . The dependence of  $l(t)$  for  $t$  when  $t \rightarrow 4\mu^2$  is investigated. A proof is given that when  $t > 4\mu^2$  the curve  $l(t)$  in the plane  $l$  goes over to the upper half plane. All these results have been obtained without assuming the existence of a Hamiltonian.

21. Production of Light Nuclei by Bombarding Heavy Elements

"Production of Light Nuclei by Bombarding Heavy Elements with 660-Mev Protons," by A. K. Lavrukhina et al., Institute of Geochemistry and Analytical Chemistry Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 1, 1962, pp 3-7

The cross sections for production of Be<sup>7</sup>, F<sup>18</sup>, Na<sup>24</sup>, Mg<sup>28</sup>, Si<sup>31</sup>, P<sup>32</sup> from Al Cu, Sb, Sn, Bi, and U under the action of 660-Mev protons are studied. It is shown that for all target nuclei  $\sigma(\text{Na}^{24}) > \sigma(\text{F}^{18})$ . The data on the cross section for production of light nuclei indicates that the production of the heavy fragments Si<sup>31</sup> and P<sup>32</sup> from copper and neighboring elements occurs as a result of disintegration and symmetry fission. The production of lighter isotopes from all target nuclei occurs as a result of fission and fragmentation. The relative contribution to the indicated processes for Na<sup>24</sup> nuclei from Cu are estimated on the basis of their angular and energy distributions. Na<sup>24</sup> nuclei with energies exceeding that of Coulomb repulsion are detected in the front hemisphere. The experimental data on the cross section for production of light nuclei are compared with some consequences of the dispersion theory of direct nuclear reactions.

22.  $\pi\pi$  Interaction From  $\pi^0$  Meson Production

"Data on  $\pi\pi$  Interaction Derived From the  $\pi^0$  Meson Production in  $\pi p$ -Collisions," by Ya. Ya. Shalamov, and A. F. Grashin, Institute of Theoretical and Experimental Physics, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 1, 1962, pp 21-24

The  $\pi^- + p \rightarrow \pi^- + \pi^+ + n$  reaction on free or quasi-free protons in the C<sub>3</sub>H<sub>8</sub> + Xe working mixture of a 17 liter bubble chamber was studied for initial  $\pi^-$  meson momenta of 2.8 Bev/c. A strong  $\pi\pi$  interaction has been detected in the energy region  $\omega = M_{\pi\pi} \approx 0.8$  Bev and in the region  $\omega \approx 1.4$  Bev. The angular distribution  $\sim \cos 2\phi_{\pi\pi}^*$  in the center of inertia system of the two mesons corresponds to the first resonance which is equivalent to the production of a vector  $\rho$  meson aligned along the initial direction. The probability of production of a mass of the two mesons  $0.35 \leq M_{\pi\pi} \lesssim 0.5$  Bev does not exceed several percent of the total cross section of the process.

23. np Scattering With 200-Mev Neutrons

"np-Scattering With 200-Mev Neutrons," by Yu. M. Kazarinov and Yu. N. Simonov, Joint Institute for Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 1, 1962, pp 35-39

The total and differential cross section for scattering of 200-Mev (effective energy) neutrons by protons are measured. The total cross section  $\sigma_t = (42.7 + 0.9) \times 10^{-27} \text{ cm}^2$ . The dependence  $\sigma(\theta)$  (in the center of inertia system) is noticeably asymmetrical with respect to the angle  $\theta = 90^\circ$ . The  $\pi$  meson-nucleon interaction constant determined by measuring the angular distribution of the scattered particles is  $f^2 = 0.08 \pm 0.02$ .

24. Angular Distribution of Alpha Particles

"Angular Distribution of  $\alpha$ -Particles From the  $\text{Li}^7(p,\alpha)\text{He}^4$  Reaction," by A. M. Petrov, Leningrad Physicotechnical Institute, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 1, 1962, pp 66-69

Experimental curves of the relative yield of  $\alpha$ -particles as a function of the square of the cosine of the emission angle in the center of inertia system are given for proton energies from 1.12 to 3.58 Mev. The dependence on proton energy of the coefficients A and B of the formula  $I(\theta_{ts.i.}) = I(90^\circ) [1 + A(E) \cos^2\theta_{ts.i.} + B(E) \cos^4\theta_{ts.i.}]$  (where  $\theta_{ts.i.}$  is the emission angle), which describes the angular distribution of  $\alpha$ -particles, is given. Curve A(E) deviates from the movement predicted by the theory.

25. Storage of Cold Neutrons

"Storage of Cold Neutrons," by A. G. Doroshkevich; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 1, 1962, pp 79-80

The possibility of storing cold neutrons in a one-m<sup>3</sup> cubic cavity with beryllium walls is considered. The lifetime of neutrons with respect to capture and heating is given. The probability of heating the neutrons by surface oscillations of the walls is estimated.

26. Gravitron Production from Electron-Positron Annihilation

"Annihilation of an Electron-Positron Pair into Two Gravitrons," by Yu. S. Vladimirov, Moscow State University; Moscow Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 1, 1962, pp 89-91

The effective differential cross section for the annihilation of an electron-positron pair into two transverse quanta of a weak gravitational field, i.e. into two gravitrons, is calculated.

27. Vector Particles With Oriented Spin

"On the Theory of Vector Particles With Oriented Spins," by Yu. M. Loskutov and Yu. A. Popov, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 1, 1962, pp 126-130

The theory of vector particles with a nonzero rest mass is examined. The wave function is obtained by taking into account spin states and the elastic scattering for various types of interactions -- scalar, vector, tensor, etc. -- is investigated.

28. Kaon-Hyperon Resonances

"On K-Meson-Hyperon Resonances," by A. I. Baz', V. G. Vaks, and A. I. Larkin; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 1, 1962, pp 166-174

On the basis of data pertaining to the behavior of the cross sections for the reactions  $\pi^- + p \rightarrow \Sigma + K$  and  $\pi^- + p \rightarrow \Lambda + K$  near the  $\Sigma + K$  threshold, it is concluded that for  $T = 1/2$  a level with a binding energy  $E \sim 30$  Mev should exist in the  $\Sigma + K$  system. This should lead in turn to a resonance in the  $\pi^- + p \rightarrow \Lambda + K$  reaction below the  $\Sigma + K$  threshold. The possibility of the existence of such levels in  $\Lambda + K$  as well as in some other systems and their connection with the resonances near corresponding thresholds is discussed.

29. Production Cross Sections for Muon and Electron-Positron Pairs

"Production Cross Sections of  $\mu^+\mu^-$  and  $e^+e^-$  for the Scattering of Neutrinos on Nuclei," by Ye. P. Shabalina, Institute of Theoretical and Experimental Physics, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 1, 1962, pp 175-180

The production cross sections for muons and electron-positron pairs are computed for neutrinos with  $E \sim 1$  Bev scattered on nuclei. The magnitudes of these cross sections are estimated in the case of incoherent scattering.

30. Dispersion Relations for Scattering of Gamma Quanta on Nuclei

"Dispersion Relations for Scattering of  $\gamma$ -Quanta on Nuclei," by S. B. Gerasimov, Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 1, 1962, pp 193-198

Scattering of low energy  $\gamma$ -quanta on nuclei is examined. Dispersion relations for the scattering amplitude at an angle  $\theta = 0^\circ$  are obtained by taking into account contributions of the nuclear excited states which are presented (according to the assumption) by the poles on the second Riemann sheet of the elastic scattering amplitude. The relations are obtained by taking into account only the nucleus + photon and the nucleus + electron - positron pair of the intermediate state (other states yield higher corrections in powers of the electric charge e). In a first approximation only those higher order terms in e which correspond to the contributions from resonances are retained in the final form of the dispersion relations.

31. Quadrupole Interaction of Nucleus With Electron Shells

"Effect of the Nuclear Quadrupole Moment on Forbidden Transitions in Hydrogenlike Atoms," by L. A. Borisoglebskiy; Lenin-grad, Optika i Spektroskopiya, Vol 13, Issue 1, Jul 62, pp 3-11

The author establishes selection rules and calculates in a non-relativistic approximation the probability of forbidden transitions necessitated by the quadrupole interaction of the nucleus with the electron shell of hydrogenlike atoms.

32. Spectral Composition of Type of Gamma Radiation

"Spectral Composition of Gamma-Radiation From Homogeneous Cylindrical Sources," by A. V. Larichev, D. P. Osanov, and V. I. Popov; Moscow, Atomnaya Energiya, Vol 13, No 2, 1962, pp 145-151

Results are given of the experimental investigation of the spectral composition of gamma-radiation emanating from large cylindrical sources filled with an aqueous solution of cobalt sulfate with isotope Co<sup>60</sup>. The change in the spectra after passing through various shielding layers is also investigated. These results are compared with those of other authors. The measurements were made on a NaI (TI) scintillation spectrometer.

33. Measurement of Alpha Particle Energies of Curium Isotopes

"Measurement of the Energies of  $\alpha$ -Particles for Several Isotopes of Curium," by R. B. Ivanov, A. S. Krivokhatskiy and V. G. Nedovesov; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 26, No 8, 1962, pp 976-978

Measurement of  $\alpha$ -particle energies were made on a magnetic  $\alpha$ -spectrometer with a double focusing beam of  $\alpha$ -particles at an angle of  $\pi\sqrt{2}$  for the isotopes of curium Cm<sup>242</sup>, Cm<sup>243</sup>, and Cm<sup>244</sup> by comparing their energies with those of the Bi<sub>2</sub>l<sub>2</sub>  $\delta$ -group.

34. Gamma Ray and Conversion Electron Spectra

Spectra of  $\gamma$ -Radiation and Internal Conversion Electrons From the Reaction Cd<sup>113</sup> ( $n\gamma$ ) Cd<sup>114</sup>, by L. V. Groshev et al.; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 26, No 8, 1962, pp 979-992

The spectra of  $\gamma$ -radiation and conversion electrons, emitted by the reaction Cd<sup>113</sup>, have already been studied in a number of works. The diagrams of the nuclear levels of Cd<sup>114</sup> is of wide interest in connection with the study of low level even-even nuclei.

A magnetic Compton spectrometer with a resolution of 0.3% for  $E\gamma > 2$  Mev and a resolution of 0.6% for  $E\gamma = 1$  Mev was used to measure the  $\gamma$ -radiation spectra in the 0.4-9.5 Mev energy range. The conversion electron spectrum in the 20-3,000 Kev electron energy range was obtained on the magnetic spectrometer with a resolution of 0.6% for  $E_e > 300$  Kev and ~ 1% for smaller energies. The preliminary results of this work were announced at the Moscow and Kingston conferences in 1960.

35. Excitation of Second Levels of Even-Even Nuclei

"Coulomb Excitation of Second Levels of Spherical Even-Even Nuclei," by Yu. P. Gangrskiy and I. Kh. Lemberg; Moscow, Izvestiya Akademii Nauk SSR, Seriya Fizicheskaya, Vol 26, No 8, 1962, pp 1001-1014

The lower levels of spherical even-even nuclei are characterized by a number of regularities which were first noted by Scharf-Goldhaber and Weneser (Phys. Rev., 98, 1955, p 212). A model of quadrupole oscillations of the nuclear surface was proposed to explain these regularities. However, within the framework of these propositions it is impossible to explain the magnitude of the energy of the first levels of even-even nuclei, the absence in a number of cases of certain components of triplet states, and the specific values of the ratios of the probabilities obtained for direct and cascade transitions for second levels  $2^+$ .

36. Positron Spectrum of Ag<sup>110\*</sup> Investigated

"Positron Spectrum Ag<sup>110\*</sup>," by N. B. Badalov et al., Physicotechnical Institute imeni A. F. Ioffe, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 26, No 8, 1962, pp 1042-1045

The positron spectrum emitted during Ag<sup>110\*</sup> decay is investigated. Up to now these positrons had not been detected. W. S. Emerich and I. D. Kurbatov (Phys. Rev., 75, 1949, p 1446) showed that the upper limit for the probability of positron production during Ag<sup>110\*</sup> decay is less than  $2 \times 10^{-3}$  positrons per decay, and W. Mims and H. Halban (Proc. Phys. Soc. America., 64, 1951, p 311) estimated the upper limit of the probability of this process to be  $5 \times 10^{-4}$  positrons per decay.

In this article the positron spectrum was investigated on a double focusing  $\beta$ -spectrometer.

37. Interaction of Fast Particles With Nuclei

"Mechanism for the Interaction of Fast Particles With Nuclei," by V. S. Barashenkov and V. M. Mal'tsev; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 26, No 8, 1962, pp 1069-1074

There are several models in existence for the mechanism of the interaction of fast nucleons with nuclei (here fast means nucleons with energies from hundreds of Mev to tens of Bev). Some of these models have been proposed to describe specific aspects of the interaction, therefore are independent of each other. Others, -- the inner nuclear cascade model and the "tube" model overlap. From comparison of computations with the experiment one of these must be disregarded. Following the computations of Metropolis and others (Phys. Rev., 110, 1958, p 204), the "tube" model was withdrawn in the energy range over 3 Bev.

Computations were made of a cascade of 9-Bev incident protons. For a comparison with photoemulsion data (V. S. Barashenkov, V. M. Maltsev and E. K. Mihul, Nucl. Phys., 24, 1961, p 642), computations were performed for an average light nucleus of the photoemulsion and for an average heavy nucleus of the photoemulsion ( $N_7^{14}$  and  $Nb_{41}^{94}$  respectively).

### 38. Instrument for Measuring Gradient of Magnetic Field

"Meter for Gradient of a Magnetic Field," by I. M. Beskrovnyy and P. T. Zabashta; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 26, No 8, 1962, pp 1092-1095

The development of various magnetic focusing systems for modern spectrometers and accelerators demands an instrument which can measure the gradient of the magnetic field with an accuracy of at least one percent. There is a simple method to measure the gradient of the magnetic field using a measuring coil which is oscillating with fixed amplitude perpendicular to the field (J. F. Fraser et al. Rev. Scient. Instrum., 26, No 5, 1955, p 475). The output voltage of the measuring coil, which is oscillating sinusoidally along the x-axis, is determined by

$$V = nAx_0 w \frac{dB}{dx},$$

where  $n$  is the number of turns in the coil;  $A$  is the surface area of the coil;  $x_0$  is the amplitude of oscillations;  $w$  is the angular frequency of the oscillations;  $\frac{dB}{dx}$  is the gradient of the magnetic field.

This method makes it possible to construct a simple and at the same time a sufficiently precise instrument. The block diagram of such an instrument is given in this paper.

### 39. Particle Losses in Cyclic Accelerator

"Particle Losses Caused by the Multiple Coulomb Scattering in a Cyclic Accelerator," by Yu. F. Orlov and S. A. Kheyfets; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 32, No 8, 1962, pp 919-923

Universal curves are found for the particle losses caused by multiple coulomb scattering in a cyclic accelerator with arbitrary injection energy.

The damping of the cross section oscillations of particles is given. The universal parameter determining the losses is

$$\frac{A_{\max}}{A_{\text{per}}}^{\frac{-2}{-2}}$$

the ratio of the means square emplitude of the maximum oscillations to the square of the permissible amplitude.

40. Control of Cyclotron Configuration Based on Model

"Control of the Configuration of the Magnetic Field Strength of the Cyclotron," by A. P. Babichev; Moscow, Atomnaya Energiya, Vol 13, No 2, 1962, pp 125-134

The experience of experiments performed on a one fifth scale model of the electromagnet of the 1.5-meter cyclotron of the Institute of Atomic Energy, Academy of Sciences USSR is given. Investigated are the optimal geometry of the magnet, which makes it possible to conserve the constancy of the magnetic field configuration, the correction of the magnetic field by circular windings located in the working gaps between the covers, and also the operation of the sector windings which cause the first harmonic and the change in depth of the magnetic field variation. Tests were made on correcting the magnetic field by circular windings installed in the gap for shimming. Corrections were made in the magnetic field by azimuth variations. The results of the investigation were used in the selection of correcting elements for the 1.5-meter cyclotron with azimuth variations of the magnetic field strength and the regulated energy.

41. Shielding of Cyclic Electron Accelerators

"Protoneutron Yield and Problems in Shielding High-Energy Cyclic Electron Accelerators," by A. V. Yelpidinskiy and I. N. Fetisov; Moscow, Atomnaya Energiya, Vol 13, No 2, 1962, pp 141-144

With an equilibrium spectrum of phonons for various materials the yield of phononeutrons from the region of the "gigantic resonance" was calculated during the absorption of electrons with energy > 30 Mev. A scheme is proposed to calculate neutron shielding in cyclic electron accelerators.

42. Protective Clothing Invented for Nuclear Radiation

Minsk, Sovetskaya Belorussiya, 2 Jun 62, p 3

Prof M. M. Pavlyuchenko of the Belorussian State University and his colleagues have invented protective clothing for nuclear radiation.

43. First South African Atomic Reactor to be Constructed

Paris, Le Monde, 11 Aug 62

The first South African atomic reactor will be constructed near Pretoria at a cost of 1,500,000 pounds sterling. The reactor, expected to be in operation by 1963, will be used for nuclear research.

44. Czechoslovak Review of Construction of Accelerators

"Breakthroughs' in the Construction of Giants"; Bratislava, Priroda a Spolecnost, No 16, Aug 62, pp 35-38

The article is devoted to discussion of the development of proton synchrotrons with particular emphasis on Soviet work and including a few facts on the design and construction during the past 2 years of an accelerator which is to have a capacity of 40 times that of the US's most powerful unit. The article suggests that even greater projects of this nature are contemplated by the Soviets.

45. Czechoslovak Nuclear Reactor Loops Described

"Experimental Reactor Loops in the Institute of Nuclear Research in Rez," by Frantisek Berger and Emil Pelcik, Institute of Nuclear Research of the Czechoslovak Academy of Sciences in Rez, Prague, Jaderna Energie, No 8, Aug 62, pp 263,266

The article reviews the main part of a Czechoslovak paper delivered at the First International Conference on Reactor Loops held in July 1961 in Dubna in the USSR. An evaluation is given on the importance of experimental loops and the loop components are briefly described. The gas-cooled loop built in the WWR-S reactor in Rez is described in some detail. An inactive rig with circulating gas, a pressurized water loop for study of the effect of radiation on metal corrosion, the design of a sodium loop with natural circulation of the coolant, and the design of an organic cooled loop are mentioned.  
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46. Czechoslovak's Conduct International School on Nuclear Physics

"International School on Nuclear Physics in the Czechoslovak Socialist Republic;" Prague, Hospodarske Noviny, No 36, 7 Sep 62, p 2

The Institute of Nuclear Research of the CSAV (Czechoslovak Academy of Sciences) is conducting an international summer school on theoretical nuclear physics at the "Partizan" Hotel in the Taly area of the Low Tatras (Nizke Tatry) Mountain range. Lectures are being presented by eight outstanding scientists in the field of theoretical nuclear physics: N. Austern of the Institute of Theoretical Physics in Copenhagen, S. T. Belyayev of the Institute of Atomic Energy in Moscow, J. P. Elliot of the University of Southampton in England, A. de-Shalit of the Weizmann Institute of Science in Israel, V. G. Solovyev of the Joint Institute of Nuclear Research in Dubna in the USSR, I. S. Shapiro of the Institute of Theoretical and Experimental Physics in Moscow, and H. A. Tolhoek of the Institute of Theoretical Physics of the University of Groningen in the Netherlands. Prof Dr V. Votruba, Corresponding Member of the CSAV, is the director of the school.

Enrolled in the school are 95 students from 28 nations of Europe, Asia, Africa, and South America. Most of these are young scientists who are thus given the opportunity of becoming familiar with the latest findings on nuclear theory and discussing their scientific problems with outstanding scientists, and establishing cooperation with foreign scientists. This is the first program of its type conducted in the socialist countries and the first summer school on physics at which are represented professors and students from socialist as well as capitalist countries. The school is being conducted with the support of the International Atomic Energy Agency.

### Plasma Physics

#### 47. Plasma Oscillations in Magnetic Field

"Low-Frequency Plasma Oscillations in a Magnetic Field," by V. D. Fedorchenko et al.; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 32, No 8, 1962, pp 958-966

In an electron beam in a magnetic field, as in a magnetic trap, into which electrons are injected at pressure of  $10^{-6}$  to  $10^{-7}$  mm of mercury, oscillations of a frequency of 100 kc are detected. These oscillations are connected with high-frequency noise generated by the electron beam.

Upon suppression of the noise at the output of the beam, the amplitude of the oscillations seldom falls. The role of the noise may also be as the exterior frequency signal. Oscillations of 100 kc may be excited during the feeding of a weak 28-29 mc signal at the input of the beam.

In the mechanism of the excitation of the observed low-frequency oscillations, the plasma, created by the beam due to the ionization of a gas filling the chamber, plays an important role. It is possible that these oscillations are excited by the irregular action of the fields in connection with the noise in the beam-plasma system. Several experiments which have been performed to verify the hypothesis are discussed.

#### 48. Variable Magnetic Field in a Plasma

"Spatial Amplification of Variable Magnetic Fields During Magnetic Acoustic Resonance in a Plasma," by I. A. Kovar et al.; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 1, 1962, pp 16-20

Magnetic acoustic resonance is investigated experimentally under linear conditions. It is shown that under resonance conditions a variable magnetic field in a plasma may increase by several times as against the initial field.

#### 49. Charged Particle Motion in a Weakly Ionized Plasma

"Hydrodynamic Description of the Motion of Charged Particles in a Weakly Ionized Plasma," by Yu. L. Klimontovich, and V. Ebeling, Moscow State University, Moscow, Zhurnal Experimental'noy i Teoreticheskoy Fiziki, Vol 43, No 1 1962, pp 146-152

A statistical derivation is given of the equations of hydrodynamic approximation for describing the motion of charged particles in a weakly ionized plasma. The space correlation functions are among the hydrodynamic functions required for the description of charged particles in a weakly ionized plasma. The interaction between charged and neutral particles is described by introducing an effective number of collisions. Examples of the solution of the equations obtained are analyzed.

#### 50. Charged Particle Motion in a Magento-Active Plasma

"The Effect of Radiation in a Charged Particle Traveling Through a Magneto-Active Plasma," by V. N. Tsytovich, Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, No 1, 1962, pp 327-329

Usually when examining the braking capacity of a plasma for fast particles, in general either the outer radiation is neglected or the radiation is considered in equilibrium.

Let there be given an outer radiation of large density, weakly interacting with a plasma (region of transparency) in a magneto-active plasma. The radiation however many interact strongly with fast particles traveling through the plasma because the plasma moderated waves are absorbed and radiated by the particles (induced Cerenkov radiation and absorption).

This article examines a series of interesting physical consequences and the possibility of using the radiation effect of a charged particle traveling through a magneto-active plasma to explain a number of effects.

#### 51. Hydrogen Plasma Research

Moscow, Leninskoye Znamya, 20 May 62

Research on hydrogen plasma is conducted at the Institute of Atomic Energy imeni I. V. Kurchatov with the experimental thermonuclear installation Ogra. The goal of this research is to attain large plasma densities at superhigh temperatures. In the same institute the physical properties of plasma are investigated on the powerful and modern instruments Orekh, Tokomak, and PR-2, which differ only as to the shape of the magnetic field and the method of heating the plasma.

Photos in the above source show the instrument panel of the Ogra and a photo of the Tokomak-2.

Moscow, Moskovskaya Pravda, 15 May 62.

A photo in the above source shows the magnetic lenses of the Ogra.

52. Equilibrium Concentration of a Substance in the Plasma of Arc Discharge

"Mechanism of Formation of an Equilibrium Concentration of Substance in the Plasma of an Arc Discharge," by I. M. Belousov; Leningrad, Optika i Spektroskopiya, Vol 13, Issue 1, Jul 62, pp 12-19

The mechanism of formation of an equilibrium of concentrations of a substance emanating from electrodes in the plasma of an arc discharge is studied. For this the direct current arc plasma was alternated for short periods from one state into another by applying on it additional current pulse.

A relative decrease in the concentration of electrode substance was detected with a decrease in pressure, at which the discharge burns. The concentration decrease is associated with the decrease of time the particles stay in the discharge zone.

The establishment of balanced spacial distribution of particles, characterized by the presence of sharp gradient of substance concentration on the plasma "boundary", takes place in a time of  $\sim 10^{-4}$  sec.

Solid State Physics53. Effect of Heat Removal Through Ends of Ingot on Zone Melting

"The Effect of Heat Removal through the Ends of an Ingot on the Results of Zone Melting," by L. G. Zabelina et al. Physico-technical Institute of the USSR Academy of Sciences imeni A. F. Ioffe; Minsk, Inzhenerno-Fizicheskiy Zhurnal, Vol 5 No 8, Aug 62, pp 81-83

In this paper it is shown that heat effects have a considerable influence on the composition distribution in a crystal with zone equilibration. The use of ring-shaped ingots makes it possible to avoid these undesirable effects.

54. Recombination on Germanium Dislocations

"Recombination on Linear Dislocations in Germanium," by L. I. Kolesnik; Leningrad, Fizika Tverdogo Tela, Vol 4, No 6, 1962, pp 1449-1454

Recombination on linear dislocations, produced through plastic deformation is investigated in germanium for electron and hole conductivity.

In the investigated temperature range, the dependence of the life time on temperature for both types of conductivity may be represented in the form of exponents with activation energy of about 0.22 ev (300-200°K) and a power function  $T^a$  where  $a = 4.4.5$ . It is shown that in germanium of electron conductivity, the dependence of the life time on temperature in the 300-100°K range is determined by the relation between the coefficient of hole capture on the dislocation and the temperature.

55. Resonance Combination Scattering in Crystals

"Resonance Combination Scattering in Crystals," by L. N. Ovander, Kiev State University imeni T. G. Shevchenko; Leningrad, Fizika Tverdogo Tela, Vol 4, No 6, 1962, pp 1471-1473

The relation between the intensity of combination scattering and the frequency of absorption-band incident light is investigated theoretically. Knowing this relation, it is possible to find the course

of the dispersion curve in this region. Two limiting cases were examined: when the absorption band is characterized by a strong oscillator but weak damping is high and the strength of the oscillator is weak.

#### 56. Temperature Dependence of Tunnel Current in Thin Junctions

"Temperature Dependence of Tunnel Current in Thin p-n Junctions," by A. P. Shotov and S. P. Grishechkina, Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 4, No 6, 1962, pp 1474-1481

The temperature dependence of a current in thin germanium p-n junctions is investigated in the temperatures range from 77 to 370°K. It is established that a tunnel current may either increase or decrease with a rise in temperature depending on the concentration of impurities in the p-n parts of the junction. The possibility of temperature coefficient control of the tunnel current either by a change in temperature and length of the fusion process or by a change in the concentration of impurities in the germanium is shown experimentally. The increase in the probability of the tunnel effect with a rise in the temperature leads to a rise in the current at the time when the temperature diffusion decreases the current.

#### 57. Optical Recharging of Impurity Centers

"Optical Recharging of Impurity Centers and Kinetics of Impurity Photoconductivity," by Yu. L. Ivanov and S. M. Ryvkin, Physicotechnical Institute imeni A. F. Ioffe, Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 4, No 6, 1962, pp 1482-1491

The illumination of a semiconductor together with the formation of free current carriers in zones leads to the redistribution of bound charges between the various types of levels (recharging of levels). This second process, which parallels the first, leads to the appearance of unusual properties in the kinetics of impurity (and inherent) photoconductivity.

These properties are experimentally investigated and explained in this paper using the photoconductivity of germanium with a multi-charged copper impurity as an example.

58. Electromagnetic Field Quantization in a Crystalline Medium

"Quantization of the Electromagnetic Field in a Crystalline Medium during Dispersion," by V. L. Strizhevskiy, Kiev State University imeni T. G. Shevchenko; Leningrad, Fizika Tverdogo Tela, Vol 4, No 6, 1962, pp 1492-1495

The methodology of electromagnetic field quantization in a crystalline medium with phenomenological calculation of the medium, developed by V. L. Strizhevskiy (FIT, No 3, 1961, p 2937), is generalized for the case of the dispersion (frequency and space) of the tensor of a dielectric constant. The results obtained also make it possible in an appropriate manner to generalize on the formulas of V. L. Strizhevskiy which describe the combined scattering of light in a crystal.

59. Kinetics of Impurity Photoconductivity

"Kinetics of Impurity Photoconductivity in n-Ge with Au," by I. A. Kurova et al., Moscow State University imeni M. V. Lomonosov; Leningrad, Fizika Tverdogo Tela, Vol 4, No 6, 1962, pp 1503-1509

The kinetics of impurity photoconductivity is investigated in n-Germanium with a partially compensated upper gold level of 0.04 ev at hydrogen temperatures. The coefficient of capture is determined for  $a_{\eta}$  electrons on Au-ions, being equal to  $2 \times 10^{-2} \text{ cm}^3 \times \text{sec}^{-1}$  at 25°K. The temperature dependence of the capture cross section  $S_n^*$  is expressed approximately by the law  $\exp(-\frac{E}{kT})$  with activation energy  $E = 0.017$ . The adhesion effect of electrons on Sb ions is developed on the basis of the kinetics of photoconductivity. Experimental data is compared with theory.

60. Electron Spectrum in Models of Liquid

"Electron Spectrum in One- and Three-Dimensional Models of Liquid," by A. I. Cubanov, Physicotechnical Institute imeni A. F. Ioffe, Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 4, No 6, 1962, pp 1510-1513

It is shown that in a one- and three-dimensional model of a liquid or another system which is not entirely ordered, various electron spectra are obtained. In this connection, the problem arises of the application of one-dimensional models to the description of actual solids.

**61. Electron Inelastic Scattering in Thin Films**

"Inelastic Scattering of Electrons in Thin Films," by N. G. Nakhodkin et al., Kiev State University imeni T. G. Shevchenko; Leningrad, Fizika Tverdogo Tela, Vol 4, No 6, 1962, pp 1514-1524

The theory of inelastic scattering of fast electrons in the case of single scattering at wide angles is developed on the basis of a generalized model of continuous losses. The thickness and angular dependences of the coefficient of inelastic scattering are calculated, as well as the energy spectra of inelastically reflected electrons. The area of applicability of the theory is established. The measurements are given for the coefficient of inelastic scattering depending on the angle of incidence of the electrons and the thickness of the films. A comparison of the theory with the experimental data of the authors and that from the literature makes it possible to conclude that the model used explains correctly the mechanism of electron scattering in thin films.

**62. Photoelectric Sensitivity of Semiconductors**

"Spectra of Photoelectric Sensitivity of Semiconductors Determined by Various Methods," by I. A. Akimov and Ye. K. Putseyko, State Optical Institute imeni S. I. Vavilov; Leningrad, Fizika Tverdogo Tela, Vol 4, No 6, 1962, pp 1542-1548

The spectral characteristics of the internal photoeffect is investigated by various methods on a series of organic and inorganic semiconductors layers of various thicknesses (photoconductivity, capacitor photoelectromotive force, contact potential, and photodielectric losses).

An analysis of the characteristics obtained and a comparison of them with the absorption spectra makes it possible to draw conclusions on the nature of the formation of the photo response.

63. Resonance Absorption and Electromagnetic Radiation in Ferromagnetics

"Effect of Resonance Absorption of Spacial Inhomogeneous Electromagnetic Radiation in Ferromagnetics," by Ye.

N. Yakovlev, Institute of Physics of High Pressures, Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 4, No 6, 1962, pp 1589-1596

It is shown that with an external radiation frequency equal to the extremal value of the spin wave energy, it is necessary to observe the resonance absorption energy by of a special inhomogeneous changing magnetic field.

64. Electromagnetic and Sound Waves in Ferroelectrics

"Electromagnetic and Sound Waves in Ferroelectrics," by D. G. Sannikov, Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 4, No 6, 1962, pp 1619-1626

The connection between the electromagnetic and sound waves in ferroelectrics of arbitrary crystalline symmetry is examined. Dispersion relations are obtained for the waves which are propagated along the crystallographic axes in ferroelectrics of rhombic and cubic symmetry. Numerical evaluations are given as well as a comparison with the experiment on the damping of waves in Rochelle salt.

65. Temperature and Frequency Dependences in Polycrystalline Ferrites

"Investigation of Temperature and Frequency Dependence of Resonance Curve Widths in Polycrystalline Ferrites," by B. M. Lebed' and Yu. M. Yakovlev, Leningrad Electrical Engineering Institute imeni V. I. Ul'yanov (Lenin); Leningrad, Fizika Tverdogo Tela, Vol 4, No 7, 1962, pp 1695-1700

The results of the experimental investigation of the ferromagnetic resonance curve width  $\Delta H$  in polycrystalline ferrites are given. The measurements were made on spherical models composed of  $0.45\text{MgO} \cdot 0.12\text{CuO} \cdot 0.38\text{Cr}_2\text{O}_3 \cdot 0.76\text{Fe}_2\text{O}_3$  and of  $3\text{Y}_2\text{O}_3 \cdot 4.65\text{Fe}_2\text{O}_3 \cdot 0.35\text{Al}_2\text{O}_3$  in the temperature range from  $-190$  to  $+300^\circ\text{C}$  on five fixed frequencies of from 500 to 9,253 megacycles. As a result of the measurements it is shown that

$\Delta H$  is dependent on the temperature at the indicated frequencies, just as in the case of monocrystals. It is shown that in the temperature range near the Curie point, the value of  $\Delta H$  decreases with a decrease in frequency. Statements are given explaining the results observed.

#### 66. Multiparticle Functions in Theory of Multiphonon Transitions

"Multiparticle Quantum Green Functions in the Theory of Multiphonon Transitions," by P. K. Kamana, Kishinev State University; Leningrad, Fizika Tverdogo Tela, Vol 4, No 7, 1962, pp 1710-1716

The possibility of an exact presentation of the multiparticle quantum Green function in the theory of multiphonon transitions is proven through the simplest function of the theory of  $\varphi$  and  $\Delta$ . The Green functional  $\sigma$  and its corresponding equation were constructed for the proof. The exact solution for the given equation is found.

67. Polarization of Magnetic Nuclei by Pulse Method

"Possibility of Obtaining Absolute Polarization of Magnetic Nuclei by the Pulse Method," by U. Kh. Kopvillem and R. V. Shubina, Kazan' Affiliate, Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 4, No 7, 1962, pp 1717-1727

The Schroedinger equation is solved for the nuclear and the electron spin system taking into account the simultaneous or the consecutive action of two pulsed magnetic or ultrasonic fields. Formulas are obtained to describe the initial pulse signal of the electron and nuclear free induction and the magnetic polarization. Two new pulse methods are proposed to polarize nuclei in diamagnetic and paramagnetic crystals which make it possible to completely polarize the nuclear spin-system at helium temperatures. The new method differs from the usual stationary method of polarization in that it is not dependent on the relaxation mechanism and makes it possible to study the unstable for the polarization of the nuclei of Cr, Fe, and Mn is given.

68. Tensor Theory of Ferromagnetic Resonance

"Tensor Theory of Ferromagnetic Resonance," by V. L. Beshidze, Sukhumi State Pedagogical Institute imeni A. M. Gor'kiy; Leningrad, Fizika Tverdogo Tela, Vol 4, No 7, 1962, pp 1748-1751

A generalization is given of the tensor theory of ferromagnetic resonance, developed by J. A. Young and E. A. Uehling (Phys. Rev., No 94, 1954, p 544) taking into consideration a more precise value for the effective magnetic field which yields a more proper value for the resonance frequency  $\omega_0$ .

A field of exchange forces connected with the nonhomogeneity of the distribution of the magnetization enters into the effective field such that the exchange forces constrict the absorption resonance curves, agreeing with experimental data.

Later the field or exchange forces depends on the speed of boundary transitions of the ferromagnetic regions.

69. Collective Excitations in Theory of Superconductivity

"Collective Excitations in the Theory of Superconductivity,"  
by E. R. Velibekov; Leningrad, Fizika Tverdogo Tela, Vol 4,  
No 7, 1962, pp 1752-1764

Collective excitations are examined in a superconductive neutral  
fermi-system at nonzero temperatures. Aside from the kinematic branch  
for the collective excitations there is also a temperature branch of  
the quasi-acoustical type.

70. Nuclear Spin-Lattice Relaxation in Ionic Crystals

"On the Theory of Nuclear Spin-Lattice Relaxation in  
Ionic Crystals," by V. Ya. Kravchenko, Institute of  
Physics, Academy of Sciences Latvian SSR; Leningrad,  
Fizika Tverdogo Tela, Vol 4, No 7, 1962, pp 1796-1802

The relaxation of nuclear spins in ideal ion crystals which  
depends on the interaction with a magnetic field of oscillating ions  
is examined. The acoustic and the optic branches (in the radio fre-  
quency range) of lattice oscillations are considered. The probabilities  
of transitions from mono-and di-phonon processes are obtained which  
show that the interactions examined are more effective than those of  
I. Waller (Z. Physik, No 79, 1932, p 370), G. R. Khutsishvili (ZhETF,  
Vol 22, 1952, p 382), and E. M. Purcell (Physica, No 17, 1951, p 282).  
Possible ways of improving the results are discussed.

71. Resonance in Uniaxial Ferromagnetics

"Resonance in Uniaxial Ferromagnetics," by N. A. Potapkov; Leningrad, Fizika Tverdogo Tela, Vol 4, No 7, 1962, pp 1803-1806

An expression is obtained for high-frequency susceptibility considering the spin-spin and the exchange spin-orbital interactions. It is shown that energy absorption with ferromagnetic resonance depends on the magnetic anisotropy. The dependence of the resonance line width on the magnetic anisotropy, and the magnitude and direction of the external magnetic field are determined.

72. Effect of Spin-Spin Interaction on Neutron Scattering in a Paramagnetic

"Effect of Spin-Spin Interaction on Neutron Scattering in a Paramagnetic," by B. M. Khabibullin, Physics Institute, Kazan' Affiliate, Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 4, No 7, 1962, pp 1826-1832

The effect of the "phonon" spin-spin interaction on the energy spectrum of neutron scattering in a paramagnetic is calculated under certain special assumptions. The curves describing the scattering undergo a shift on the order of the value of the shift attributed to relaxation effects.

73. Measurement of Relaxation Time in p-n Transitions

"Measurement of Short Lifetimes From Phase Characteristic of the Voltage Transmission Coefficient in a Circuit With p-n Junction," by E. I. Andirovich, A. N. Gubkin, and B. D. Kopylovskiy, Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 4, No 7, 1962, pp 1853-1862

The phase method proposed by E. I. Adirovich (FTT, No 1, 1959, p 1115) which makes it possible to measure the relaxation time of electron processes in high-frequency p-n transitions is tried out experimentally. The method is useful for diodes with thick and thin bases. An analysis is given of the conditions whose experimental enactment make it possible to determine the lifetime of the nonuniform charge carriers in the base material in p-n transitions. An experimental installation was developed and used to measure  $\tau$  in the range  $10^{-7}$  -  $10^{-9}$  seconds for ten different types of germanium and silicon diodes.

74. Photomagnetic Effect in Strong Magnetic Fields

"On the Theory of Photomagnetic Effect in Strong Magnetic Fields," by Yu. I. Ravich, Institute of Semiconductors, Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 4, No 7, 1962, pp 1928-1937

A calculation is made of the effect of the longitudinal electric field on the nonuniform concentration of the carriers within the theory of photomagnetic effect in semiconductors. It is shown that this effect is important in strong magnetic fields for the calculation of the photomagnetic emf and the current-voltage characteristic if the illumination is high or the semiconductor is intrinsic, and also for the calculation of the compensation voltage of the photomagnetic effect by photoconductivity.

75. Repolarization of Ferroelectrics

"New Method to Study the Repolarization of Ferroelectrics," by V. M. Petrov and A. M. Shirokov; Moscow, Vestnik Moskovskogo Universiteta, Seriya III, Fizika, Astronomiya, No 3, 1962, pp 59-62

The use of a new method based on the observation of the change with time in the SHF dielectric permeability when a pulse of mixed voltage is fed to the sample is proposed to investigate the repolarization process of ferroelectrics. The preliminary results obtained by this method are given.

76. Space Charge Compensation in Thermal Elements

"Compensation of the Electron Space Charge in Vacuum Thermal Elements," by F. G. Baksh, Institute of Semiconductors, Academy of Sciences USSR; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 32, No 8, 1962, pp 975-985

The possibility is examined of compensating the electron space charge by ions which are created as a result of contact ionization on the ion emitter. The distribution of the potential between the electron and the ion emitters, which are infinite parallel planes with respect to each other, is calculated. Analyzed are the working modes of the vacuum thermal element with compensation of the volumetric charge when the source is a cathode and the distribution of the potential is characterized by the presence of one minimum. It is shown that in this case, the extension of the minimum potential with an increase in the interelectron distance is limited by the formation of a region with compensated space charge.

77. Energy Migration Between Impurity Molecules Crystals

"Migration of Energy Between Impurity Molecules in Molecular Crystals," by N. D. Zhevandrov, V. I. Gribkov and Sh. D. Khan-Mogometova; Leningrad, Optika i Spektroskopiya, Vol 13, Issue 1, Jul 62, pp 96-99

On the basis of the independence of fluorescence polarization of a molecular crystal from polarization of exciting light, it is shown that between the molecules of naphthacene, embedded in an anthracene lattice, a migration of energy up to 25 lattice spacings takes place. Shown by the same method is the presence of energy migration in stilbene, anthracene, and anthracene-naphthacene crystals at a temperature of -196° C.

Mechanics78. Integral Kinetic Equations

"Integral Kinetic Equations for the Case of an Arbitrary Conservative Field of Internal Mass Forces," by S. V. Vallander, E. A. Gurmuzova, and B. V. Filippov; Leningrad, Vestnik Leningradskogo Universiteta. Seriya Matematiki, Mekhaniki i Astronomii, No 13, Issue 3, 1962, pp 87-89

The article presents a system of integral kinetic equations which is a generalization of equations obtained by S. V. Vallander and A. V. Belova ("Integral Kinetic Equations for Mixtures of Gases with Internal Degrees of Freedom," Vestnik LGU, No 7, 1961) and others.

The equations describe the motion of gases consisting of particles with internal degrees of freedom in an arbitrary conservative field of mass forces.

Submitted for publication 10 Jan 61.

79. Effect of Intermediate Medium on Gravitational Interaction

"Experimental Investigation of the Effect of an Intermediate Medium on Gravitational Interaction," by V. B. Braginskiy, V. N. Rudenko, and G. I. Rukman, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 43, 1962, pp 51-58

The effect of an intermediate medium on the gravitational interaction is investigated. A sensitive measuring device could register the possible changes in the weight of a 10-kg mass when screened by a steel sheet 10 cm thick. A modulation method was used as well as an electromechanical

transducer, an electronic device for optimal separation of the signal from the noise. A statistical method of analysis was applied and an estimation made of the reliability of the results. Under the conditions of the experiments no effect of the intermediate medium on gravitational interaction was detected. The probability that in the experiments an effect on the order of  $\geq 1.3 \times 10^{-10}$  of the gravitational interaction was not noted is  $\sim 0.04$  (and correspondingly it is  $\sim 0.002$  for an effect on the order of  $\geq 2 \times 10^{-10}$ ).

#### 80. Critical Load for Body With Nearly Circular Crack

"Widening of a Crack Having a Shape Close to the Circular in the Plane," by V. V. Panacyuk (Presented by G. N. Savin, member of the Academy of Sciences Ukrainian SSR; Kiev, Dopovidi Akademiyi Nauk Ukrayins'koyi RSR, No 7, 1962, pp 891-895)

An approximate method is developed for determining the ultimate (critical) load for an infinite elastic body with an internal macroscopic, nearly circular crack, loaded with arbitrary external stretching forces that are symmetrical with respect to the plane of the crack. On the basis of the proposed method, the author gives the solution of certain special examples.

#### 81. Linear Approximation of Tensor Components

"On the Equivalent Linearization of Nonlinear Equations of the Theory of Elasticity and the Application of Equivalent Linearization to Problems of the Theory of Stability of Shells," by N. A. Kil'chev's'kyy, corresponding member of the Academy of Sciences Ukrainian SSK; Kiev, Dopovidi Akademiyi Nauk Ukrayins'koyi RSR, No 7, 1962, pp 875-879

The author discusses the application of a variation of the method of equivalent linearization to the linear approximation of the tensor components of finite deformation of an elastic medium. The construction of a linearly deformed equivalent and the application of this construction to the special problem of the statistical stability of a cylindrical shell are outlined.

#### 82. Equations of Transonic Gas Flow

"On Some Integrals of Transonic Gas Flow Equations," by M. D. Ladyzhenskiy; Moscow, Inzhenernyy Zhurnal, Vol 2, No 1, 1962, pp 6-10

Closed solutions are derived in this work for transonic gas flow equations, characteristic of sonic flow around a paraboloid of rotation and point sources flows from placed in flat or axially symmetric sonic ducts.

83. Heater Operation Under Various Flow Conditions

"Heater Calculation in Forced Fluid Motion," by A. L. Iskra; Moscow, Inzhenernyy Zhurnal, Vol 2, No 1, 1962, pp 17-28

Analyzed is the operation of heaters under steady and irregular flow conditions. All calculations are carried out for electric heaters, but the results obtained and the method of calculation are also applicable to other types of heaters. Along with solutions of heat transfer equations of a most general form, several specific examples are examined. The analysis of the influence of various parameters on dimensions of the heaters is given.

84. Turbulent Boundary Layer on a Porous Surface

"Turbulent Boundary Layer With Pressure Gradients on a Porous Surface," by A. I. Tolstykh; Moscow, Inzhenernyy Zhurnal, Vol 2, No 1, 1962, pp 79-86

The existing methods of calculation of a turbulent boundary layer with feed of a substance through the surface are restricted only to the case of zero pressure gradients and are based on applications of the same semi-empirical relations as in the case of an impenetrable plate (V. Dorrans and F. Dor, Sbornik, Mekhanika, No 3, 1955, et al). This, because of a lack of experimental data, inevitably leads to the assumption of the independence of some variables from parameters of mass exchange and a certain arbitrariness in the choice of necessary constants.

The purpose of this work is investigation of a more general case, namely, the turbulent layer on a porous surface in the presence of pressure gradients, without introduction of some semiempirical relation, and by use of only that information which may be obtained from the previous history of the flow.

Analyzed in the beginning is the incompressible boundary layer without diffusion, and then a formal generalization in the case of a heterogeneous mixture of compressible gas is developed.

85. Prismatic Shells Under Stresses

"On Calculation of Prismatic Shells Under Stresses," by A. N. Yelpat'yevskiy and V. V. Vasil'yev; Moscow, Inzhenernyy Zhurnal, Vol 2, No 1, 1962, pp 117-129

The author gives the construction of a variational method of calculation of moment-free prismatic (in the general case multiple-connected) shells, based on the Castigliano principle.

For construction of the solution, the normal longitudinal stresses are given in the form of expanded functions which depend on boundary coordinates.

By integration of the differential equations through the same terms of the series, shear and normal boundary stresses are expressed. A classical variational problem is then solved on the basis of which are determined generalized stresses which are coefficients of the series.

It should be noted that this type of solutions were used in the works of L. I. Balabukh, V. F. Kiselev, V. V. Novitskiy, A. F. Feofanov, and other authors, however, only for particular kinds of approximating functions.

#### 86. Shock Wave Action on Obstacles

"Action of a Shock Wave on an Obstacle," by A. A. Nikol'skiy and V. A. Smirnov; Moscow, Inzhenernyy Zhurnal, Vol 2, No 1, 1962, pp 181-188

The impulse forces acting on an obstacle during shock wave passage are considered. In the case where the velocities of gas particles are sufficiently small and the vorticity of the flow may be disregarded, it is shown that the problem reduces to a determination of streamlined flow of an incompressible liquid around a body. Examined are some specific obstacles, both flat and three-dimensional. Obtained for them are total impulse forces and impulse moments as well as the distribution of pressure impulses along the surface of the bodies.

#### Thermodynamics

#### 87. Heat Transfer in Turbulent Liquid Flow

"Heat Transfer in the Region of Thermal Stabilization for Turbulent Flow of Liquid Metals in a Duct," by V. I. Subbotin, Moscow, Atomnaya Energiya, Vol 13, No 2, 1962, pp 155-161

The local coefficients are investigated for the heat transfer of liquid metal turbulently flowing ( $Pr = 0.02$ ) in the region of heat stabilization ( $l_T$  equals 5; 10; 15 d) when  $Re = 10^4 - 2 \times 10^5$ . Two methods were used: by measuring and treating the temperature of the profile in the flow without considering the thermal contact resistance, and by direct measurement of the temperature of the wall considering the thermal contact resistance. The hydrodynamic stabilization of the flow ( $l_T \approx 30$  d) was preserved in the experiments.

88. Heat Transfer in Rotating Cylinders

"An Investigation of Heat Transfer of a Turbulent Air Flow in an Annular Space Between Rotating Coaxial Cylinders," by S. I. Kosterin and Yu. P. Finat'yev, Institute of Mechanics, Academy of Sciences USSR; Minsk, Inzhenerno-Fizicheskiy Zhurnal, Vol 5, No 8, Aug 62, pp 3-9

Results of preliminary investigations of heat transfer in an annular space have confirmed conclusions drawn on the basis of experimental data on the hydrodynamics of a turbulent flow in the annular space (for axial pumping of gas and rotation of the inner cylinder). It is established that (1) there exist under these conditions two types of flow behavior: pure turbulent flow and turbulent flow with eddies on a large scale; (2) heat transfer values for these two types of flow are essentially different; and (3) the relative size of the annular space within the limits from 0.1 to 0.3 has a negligible effect on heat transfer processes.

On the basis of the investigations, formulas are recommended for calculating heat transfer in a smooth annular space with a rotating inner cylinder and axial pumping of gas and for the relationship determining the transition from a purely turbulent flow to a flow with large-scale eddies during heat transfer.

89. Heat Transfer for Large Prandtl Numbers and Variable Viscosity

"Heat Transfer in a Turbulent Liquid Flow for Large Values of Prandtl Numbers and Variable Viscosity," by Tsai Ko-En, Polytechnic Institute imeni M. I. Kalinin; Minsk, Inzhenerno-Fizicheskiy Zhurnal, Vol 5, No 8, Aug 62, pp 10-16

An analytical solution is given for the problem of heat transfer in a turbulent liquid flow with high Prandtl numbers. The effect of temperature on the change in viscosity is calculated.

90. Temperature Distribution in Plates Cooled by Radiation in Vacuum

"The Temperature Distribution in Round and Rectangular Plates Cooled by Radiation in a Vacuum for a Given Temperature on the Perimeter," by A. P. Bukhvostov and V. Ya. Fenkel', Phisico-technical Institute of the USSR Academy of Sciences imeni A. F. Ioffe; Minsk, Inzhenerno-Fizicheskiy Zhurnal, Vol 5, No 8, Aug 62, pp 78-80

The solution to the problem of temperature distribution along the surfaces of round and rectangular plates is given. A plate is cooled by radiation in a vacuum, and the temperature along its perimeter is maintained constant. Formulas obtained relate the maximum temperature drop along the surface of the plate to physical characteristics of the material and geometry of the plate.

91. Thermal Equilibrium in High-Temperature Gas Jet

"The Problem of Thermal Equilibrium in a High-Temperature Gas Jet," by Ye. V. Garkavyy, Power Engineering Institute of the Academy of Sciences Belorussian SSR; Minsk, Inzhenerno-Fizicheskiy Zhurnal, Vol 5, No 8, Aug 62, pp 84-86

It is shown that in a high-temperature gas jet obtained by means of nitrogen-stabilized high-current arc discharge, the distribution of atoms along excited levels follows the Boltzmann law. In this way it is shown that thermal equilibrium exists in the jet.

92. Heat Conduction of Plane-Parallel Layer

"Heat Conduction of a Plane-Parallel Layer," by S. M. Kotlyar; Minsk, Inzhenerno-Fizicheskiy Zhurnal, Vol 5, No 8, Aug 62, pp 97-100

The paper presents a method of constructing temperature distribution functions in a plane-parallel layer with mixed boundary conditions (using cylindrical coordinates):

$$T = f(r) \quad r < a, z = 0;$$

$$-\frac{\partial T}{\partial z} + hT = 0 \quad r > a, z = 0;$$

$$\lambda \frac{\partial T}{\partial z} + \alpha T = 0 \quad 0 < r < \infty, z = b;$$

where  $h$  is the coefficient of heat exchange and  $\lambda$  and  $\alpha$  are parameters.

The temperature distribution function is found in the form of an improper integral from an auxiliary function satisfying the equation

$$\phi(x) - \frac{1}{\lambda} \int_0^x \phi(t) [G(t+x) + G(t-x)] dt = F(x),$$

where  $\phi(t)$  is an unknown function, continuous with its derivative in the interval  $[0, a]$ .

93. Heat Exchange in Turbulent Boundary Layer

"Heat Exchange in Turbulent Boundary Layer of Compressible Gas," by Yu. A. Koshmarov; Moscow, Inzhenernyy Zhurnal, Vol 2, No 1, 1962, pp 41-54

Cited in this article are results of experimental research on heat exchange in a turbulent boundary layer in the presence of longitudinal negative gradients of pressure in the number ranges  $Re_\theta = 10^3 - 5 \times 10^3$ ,  $M=1.5-3.5$ ,  $T_w=0.52$ ,  $P=0.01 \times 10^{-6} - 1 \times 10^{-6}$ . The influence of the longitudinal negative gradient of pressure on the law of heat exchange, representing the relation between the local value of the heat flow and the width of energy loss, was not detected in the experiment. A simple method of calculation of heat transfer in a turbulent boundary layer of compressible gas with accelerated motion of outer stream, similar to supersonic jets, is presented.

Optics and Spectroscopy94. Pulse Discharges in Pulsed Light Sources

"High-Current Pulses (Spark) Discharges in Gases Used in Pulsed Light Sources," by I. S. Marshak; Moscow, Uspekhi Fizicheskikh Nauk, Vol 77, No 2, Jun 62, pp 229-286

High current pulse discharges in gases have been subjected in the last 10-15 years to a profound study, both in connection with new methods of observation of highly transitory processes, and the urgency of their scientific and engineering applications (production of high-temperature plasma for thermonuclear reactions, pulsed light sources, high-voltage engineering, spark erosion machining of metals, switching apparatus, and others).

Each of the applications has introduced specific programs of research (for example, high temperature and problems connected with it in magnetic confinement of plasma in the field of thermonuclear reactions, high-light yield, compactness, controllability and stability in the field of pulse light sources, intensive breakdown of electrodes in the field of spark erosion, etc). Such an orientation of research and its fast rate of execution in many laboratories has led to formation of several independent specialized branches of science dealing with high-current pulse discharges in gases. The coordination between these branches of science is at present clearly inadequate. The scattering of material in unrelated fragmentary publications with almost a complete lack of generalizing works hampers this coordination to a considerable extent. The purpose of this article is to make up this deficiency partially by generalizing the works in the field of high-current pulse discharges used in pulsed light sources. The necessity of such generalization also became urgent from the point of view of the development of the very problem itself. Examined in this article are pulse discharges under pressures, close to atmospheric, voltages from several hundred to thousands

of volts, lengths of discharge intervals from several mm (inert and molecular gases at pressures of several technical atmospheres) to many cm (inert gases in small tubes, under pressure of hundreds of mm of mercury). The range of discharge duration is  $10^{-7}$  -  $10^2$  sec; the range of energies discharged across the gas gap is  $10^{-3}$  -  $10^5$  joules; and the range of frequencies of discharge repetition is from single pulses to  $10^4$  cycles per second.

#### 95. Determination of Wave Length Difference of Two Spectral Lines

"Precise Measurement of the Distance between Two Spectral Lines using Two Photomultipliers," by R. I. Semenov; Leningrad, Optika i Spektroskopiya, Vol 13, Issue 1, Jul 62, pp 134-136

The proposed method allows to determine with great precision the difference in wave lengths of two close lines ( $\Delta\lambda$  from 0.5 to several angstroms), for example Zeeman components or a narrow thin lattice. This method is similar to those used in metrology (Opt. Soc. Amer., 46, 477, 1956, et al.).

## II. MATHEMATICS

96. Excesses Over Preassigned Levels in Random Operations

"Excesses of Random Operations," by V. I. Tikhonov; Moscow,  
Uspekhi Fizicheskikh Nauk, Vol 77, No 3, Jul 62, pp 449-480

The article is concerned with the so-called "excesses"  $N$  over a preassigned level  $C$  in a random operation. First of all, it is necessary to imagine the random operation portrayed graphically as a function of time, similar to a sine wave, with the preassigned level  $C$  as the time axis.  $H$  is the magnitude of an excess;  $H_m$  is the maximum  $H$  occurring over a given time interval  $T$ ;  $h$  is the absolute value of the sum of a minimum and the next maximum following it -- or vice versa -- corresponding to twice the amplitude of a sine wave;  $\tau_0$  is the elapsed time to the beginning of the first excess;  $\tau$  is the "width" of an excess, corresponding to the time interval for the positive half of a sine curve; and  $\theta$  is the time interval between excesses, corresponding to the time interval for the negative half of a sine curve.

Two general types of problems are studied:

- (1) The determination of quantities characterizing the distribution of the number of excesses occurring with different groups of widths  $\tau$  for several preassigned levels  $C$ .
- (2) The determination of the distributions of the random variables  $\tau_0$ ,  $\tau$ ,  $\theta$ ,  $H_m$ ,  $H$ , and  $h$  for different time intervals  $T$ .

The author states that the operation of the majority of seismic instruments and medical instruments for registering heart and brain action is based on the magnitudes and widths of excesses over a predetermined level, as well as the time intervals between them. Probability considerations of this type are applicable also to problems in signal-to-noise ratio, fluctuating noise in electronic instruments, heat fluctuation, intrinsic noise in radio receivers, atmospheric interference, atmospheric turbulence, and cosmic noise. A number of examples from the foregoing are used as illustrations.

97. Differential Equations in Locally Convex Spaces

"A Theory of Differential Equations in Locally Convex Spaces," by V. M. Millionshchikov; Moscow, Matematicheskiy Sbornik. Novaya Seriya, Vol 57 (99), No 4, Aug 62, pp 385-406

In this paper several theorems relating to complete, locally convex spaces (as typified by the equation  $dx/dt = f(x, t)$  in Banach space) are generalized. The article is divided into 3 parts: (1) integration in locally convex spaces, (2) the principle of a fixed point in locally convex spaces, and (3) theorems of existence and uniqueness, continuous dependence on initial conditions and the right side of equations, and boundedness and stability of solutions of differential equations in locally convex spaces.

Submitted for publication 21 Dec 60.

98. First-Order Differential Equations With a Small Parameter

"Solution of a First-Order Differential Equation With a Small Parameter, Not Solved With Respect to the Derivative," by N. S. Satskaya; Moscow, Matematicheskiy Sbornik. Novaya Seriya, Vol 57 (99), No 4, Aug 62, pp 517-526

The article is concerned with differential equations having a small parameter connected with the derivative, of the form

$$\mu F(x, y, y') = f(x, y)$$

for

$$y(x_0, \mu) = y_0,$$

where  $\mu > 0$  is the small parameter.

Submitted for publication 28 Feb 61.

99. Partially Hypoelliptic Differential Equations

"Partially Hypoelliptic Differential Equations with Partial Derivatives Having Constant Coefficients," by Ye. A. Gorin; Moscow, Sibirskiy Matematicheskiy Zhurnal, Vol 3, No 4, Jul/Aug 62, pp 500-526

The article deals with a class of partially hypoelliptic equations. The solutions of these equations are shown to be smooth in the ordinary sense for chosen variables. A theorem of Seidenberg and Tarski is relied upon in the case of finite-order equations to determine necessary and sufficient conditions for partial hypoellipticity.

The article is in two parts. The first, covers such topics as the asymptotic behavior of algebraic surfaces and the algebraic definition of partial hypoellipticity. The second part discusses differential equations, including partially hypoelliptic differential operations.

100. Convergence of Sequence to System of Differential Equations

"A Sequence Which Converges to the Solution of a System of Ordinary Differential Equations," by S. A. Pak, Moscow, Sibirskiy Matematicheskiy Zhurnal, Vol 3, No 4, Jul/Aug 62, pp 569-574

In this article the author investigates a sequence which allows an estimate of the solution  $u$  of the form  $z \geq u$  for the system

$$N[y] = y' - f(x, y) \leq 0, \quad y(a) = \text{constant}$$

where  $y = (y_1(x), y_2(x), \dots, y_n(x))$ ,  $f(x, y) = (f_1(x, y_1, \dots, y_n), f_2(x, y_1, \dots, y_n), \dots, f_n(x, y_1, \dots, y_n))$ .

The inequality  $z \geq u$  between vectors  $z$  and  $u$  is taken to mean the inequalities  $z_k \geq u_k$  ( $k = 1, 2, \dots, n$ ) between corresponding components.

Submitted 30 Mar 60.

**101. Stability of Solutions of System of Differential Equations During Continuous Disturbance**

"The Stability, in the Large, of the Solutions of a Countable System of Differential Equations During Continuous Disturbances," by S. I. Gorshin; Alma-Ata, Izvestiya Akademii Nauk Kazakhskoy SSR. Seriya Matematiki i Mekhaniki, No 10 (14), 1962, pp 51-55

The author investigates a countable system of differential equations,

$$\frac{dx^s}{dt} = \omega_s(t, x_1, x_2, \dots) - f_s(t, x_1, x_2, \dots) \quad (s = 1, 2, \dots),$$

where  $t$  is a real, independent variable;  $x_1, x_2, \dots$  are unknown, real functions of  $t$ ;  $\omega_s$  are given, real functions of  $t, x_1, x_2, \dots$ ; and  $f_s$  are functions expressing the disturbances.  $\omega_s$  and  $f_s$  are assumed to be single-valued and continuous with respect to  $t$ .

Two theorems are proved: one for the stability and the other for the instability of the solutions of the system of equations considered without the disturbance:

$$\frac{dx^s}{dt} - \omega_s(t, x_1, x_2, \dots) \quad (s = 1, 2, \dots).$$

**102. Solution and Validity of System of Linear Differential Equations**

"The Form of the Solution and the Validity of a System of Linear Differential Equations," by Yu. G. Zolotarev and V. Kh. Kharasakhal; Alma-Ata, Izvestiya Akademii Nauk Kazakhskoy SSR. Seriya Matematiki i Mekhaniki, No 10 (14), 1962, pp 11-16

A system of differential equation  $X' P(t)X$  is considered, where  $X$  is a single-column  $n$ th order matrix of the required function,  $X'$  is its derivative, and  $P(t) = \{p_{s_k}(t)\}_{n_1}^{n_1}$  is a square matrix whose elements are real and continuous functions of a variable  $t$ , such that  $\sum_{k=1}^n |p_{s_k}(t)| \geq a$  ( $s = 1, \dots, n$ ),  $a = \text{constant}$ .

For the given conditions there exists a fundamental system of the solution  $X(t)$ ,  $X(t) = E$ , where  $E$  is a single matrix.

103. Differential Equations in Banach Space With Constant Unbounded Operators

"A Theory of Differential Equations in Branch Space with Constant Unbounded Operators" (presented by Academician Z. I. Khalilov, Academy of Sciences Azerbaydzhan SSR, by Yu. I. Domshlak, Institute of Mathematics and Mechanics; Baku, Doklady Akademii Nauk Azerbaydzhanskoy SSR, Vol 18, No 5, 1962, pp 3-6

The author looks at abstract functions in Banach space. A treatise by Schaffer on unbounded operators (J. Publ. Inst. Mat. Estad., Uruguay, 1958, Vol 3 No 3) us cibsduderedl abd severak tgeirens relating to the properties of bounded and unbounded operators are proven.

104. Information-Stable Sequences of Channels

"Information-Stable Sequences of Channels," by Hu Kuo Ting; Moscow, Teoriya Veroyatnostey i yeye Primeneniya, Vol 7, No 3, 1962, pp 271-282

In this paper it is proved that the condition on information-stable sequences of channels is not only sufficient but also necessary for the validity of Feinstein's lemma and Shannon's theorem.

105. B. V. Gnedenko's Works on Probability Theory

"The Works of B. V. Gnedenko on Probability Theory," by A. N. Kolmogorov; Moscow, Teoriya Veroyatnostey i yeye Primeneniya, Vol 7, No 3, 1962, pp 323-329

The article is a summary of B. V. Gnedenko's achievements in the field of probability theory on the occasion of his 50th birthday. According to the author, his most important contributions to the theory of probability date from 1937. Much of his work has been on the distributions of sums of sequences, and in 1949 a monograph written jointly by him and Kolmogorov entitled "Limiting Distributions for the Sums of Independent Random Variables" was translated into English, German, Hungarian, Polish, and Chinese. More recently he has been occupied with mathematical statistics on such problems as determining the distributions of maximum deviations of empirical functions from theoretical functions.

106. Necessary and Sufficient Conditions for Continuity of Functionals

"Necessary and Sufficient Conditions for Continuity and Semicontinuity of Functionals in the Calculus of Variations," by S. F. Morozov and V. I. Plotnikov; Moscow, Matematicheskiy Sbornik. Novaya Seriya, Vol 57, No 3, Jul 62, pp 265-280

The purpose of this article is to establish the necessary and sufficient conditions for semicontinuity of functionals in the calculus of variations of the general form

$$(v, w, G, F) \int_G F(\vec{x}, \vec{v}(x), \vec{w}(x)) d\Omega,$$

where the continuous function  $F$  is not considered to be differentiable. The proof of a theorem on semicontinuity makes it possible to weaken the conditions imposed on the integrand  $F$  in theorems on the existence of continuous solutions of variational problems.

Submitted for publication 30 May 60.

107. Transformation of Parabolic Equations

"Transformation of Parabolic Equations," by I. D. Cherkasov; Moscow, Matematicheskiy Sbornik. Novaya Seriya, Vol 57, No 3, Jul 62, pp 297-318

The author studies the second-order differential equation

$$\frac{\partial f(t, x)}{\partial t} + B^{ij}(t, x) \frac{\partial^2 f(t, x)}{\partial x^i \partial x^j} + A^i(t, x) \frac{\partial f(t, x)}{\partial x^i} = 0,$$

whose coefficients  $B^{ij}$  and  $A^i$  are defined in an  $(n+1)$ -dimensional manifold  $M_{n+1} = (x^1, \dots, x^n, t)$  and have continuous derivatives to the order necessary for the study of this equation. On the function  $f(t, x)$  are imposed the additional limitations that  $f$  exists and is unique.

Another equation

$$\frac{\partial \tilde{u}}{\partial t} (\tau, u') + B^{ij}(\tau, u') \frac{\partial^2 \tilde{u}}{\partial u^i \partial u^j} (\tau, u') + A^i(\tau, u') \frac{\partial \tilde{u}}{\partial u^i} (\tau, u') = 0$$

is given, with coefficients defined in the manifold  $M_{(n+1)'} = (u^1, \dots, u^n, t)$ . It is assumed that the limitations imposed on the function  $\tilde{u}$  are invariant with respect to the transformation of the coordinate system  $x_i$  and time  $t$  according to the relations  $t' = \varphi(t)$  and  $x' = \varphi'(t, x^1, \dots, x^n)$ .

Submitted for publication 5 Oct 60

108. Generalized First Boundary Value Problem

A Generalized First Boundary Value Problem for a Certain Class of Differential Operators, Part I, by P. P. Mosolov; Moscow, Matematicheskiy Sbornik. Novaya Seriya, Vol 57, No 3, Jul 62, pp 333-374

The author studies an elliptical second-order equation of the form

$$A \left( \bar{x}, \frac{\partial}{\partial \bar{x}} \right) u(\bar{x}) = \sum_{j=0}^{2m} a_{i_1, \dots, i_n}(x_1, \dots, x_n) \frac{\partial^j u(x_1, \dots, x_n)}{\partial x_1^{i_1} \dots \partial x_n^{i_n}} = f(x_1, \dots, x_n)$$

$i_1 + \dots + i_n = j$

in a region  $\Omega$  whose boundary is a closed surface, such that if each of its points is related to a local coordinate system one of whose axes is orthogonal to the surface while the remaining ones lie in a tangential plane, the equation of the surface for this coordinate system has  $m-1$  continuous derivatives.

In addition to theorems on the existence and uniqueness of the solution of the boundary value problem, theorems are obtained for the degree of differentiability of the arbitrary generalized solution of the equation within the region, depending on the smoothness of the right side of the equation for conditions of sufficient differentiability of the coefficients.

Submitted for publication 31 Jan 61.

109. One-Sided Boundary Value Problems With Analytic Functions

"One-Sided Boundary Value Problems in the Theory of Analytic Functions" (presented by Academician V. I. Smirnov, 23 Feb 62), by E. I. Zverovich and G. S. Litvinchuk, Rostov-on-Don State University; Moscow, Doklady Akademii Nauk SSSR, Vol 145, No 2, 11 Jul 62, pp 266-269

The author investigates the solutions of 1-sided boundary value problems defined by analytic functions and the conditions for their being solvable.

110. Dirichlet Problem for Angular Regions

"Differential Properties of the Solution of the Dirichlet Problem for Angular Regions" (presented by Academician S. L. Sobolev, 24 Feb 62), by M. A. Aleksidze, computing center of the Academy of Sciences Georgian SSR; Moscow, Doklady Akademii Nauk SSSR, Vol 145, No 2, 11 Jul 62, pp 239-240

The article discusses the question as to whether or not there exist sufficiently smooth solutions of the problem

$$\Delta u = 0 \text{ in } R,$$

$$u|_{AB} = P_{n_1}(s), \quad u|_{BC} = P_{n_2}(s), \quad u|_{CD} = P_{n_3}(s), \quad u|_{AD} = P_{n_4}(s);$$

$$\Delta v = P_m(x, y) \text{ in } R,$$

$$v|_{AB} = v|_{BC} = v|_{CD} = v|_{AD} = 0,$$

where AB, BC, CD, AD are sides of a rectangle R;  $P_m(x, y)$  is an  $m$ th order polynomial in x and y; and  $P_{n_i}(s)$  ( $i = 1, 2, 3, 4$ ) are  $n_i$ th order polynomials in the parameter s.

111. Minimal Systems and Quasi Complements in Banach Space

"Minimal Systems and Quasi Complements in Banach Space" (presented by Academician A. N. Kolmogorov, 23 Feb (62), by V. I. Gurariy and M. I. Kadets, Khar'kov Highway Institute and Khar'kov Higher Military Aviation School; Moscow, Doklady Akademii Nauk SSSR, Vol 145, No 2, 11 Jul 62, pp 256-258

Several theorems are proven relating to minimal systems in Banach space. Conditions are given for isometric and quasi-complementary subspaces.

112. Short-Wave Asymptotic Formulas

"Short-Wave Asymptotic Formulas in the Problem of Diffraction on Convex Bodies," by V. S. Buslayev; Leningrad, Vestnik Leningradskogo Universiteta. Seriya Matematiki, Mekhaniki i Astronomii, No 13, Issue 3, 1962, pp 5-21

Short-wave asymptotes of Green's function of the external Dirichlet problem for the Helmholtz equation on a plane are considered. The formulas have the form of the Airy integral and are continuous functions, including the shadow-light bound. The result of the action of the Helmholtz operator on the asymptotes is estimated.

113. Nonlocal Problems in Theory of Oscillation

"Nonlocal Problems in the Theory of Oscillation," by V. A. Pliss; Leningrad, Vestnik Leningradskogo Universiteta. Seriya Matematiki, Mekhaniki i Astronomii, No 13, Issue 3, 1962, pp 30-46

A review of the modern works on nonlocal theory of oscillations is given.

114. Convex Properties of Stability Domains

"Convex Properties of Stability Domains of Linear Hamiltonian Systems of Differential Equations With Periodic Coefficients," by V. A. Yakubovich; Leningrad, Vestnik Leningradskogo Universiteta. Seriya Matematiki, Mekhaniki i Astronomii, No 13, Issue 3, 1962, pp 61-85

Given that  $M$  is a set in a functional space of Hamiltonians  $H(t)$ ,  $M$  is said to be  $(t)$ -convex if from

$H_1(t) \Sigma M, H_2(t) \Sigma M, H_1(t) \leq H(t) \leq H_2(t)$   
it follows that  $H(t) \Sigma M$ .

All of the stability domains are shown to be  $(t)$ -convex if the order of the system  $2k \leq 4$ . In the case  $2k > 4$  it is determined which stability domains are  $(t)$ -convex and which are not.

By means of convex properties it is possible to obtain various and easily verified sufficient conditions of stability of Hamiltonian systems. These conditions give Hamiltonians for every stability domain  $O(u)$ .

115. Quantum Field Theory in Constant Curvature p-Space

"Quantum Field Theory in Constant Curvature p-Space," by Yu. S. Golvfand, Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimentalnoy i Teoreticheskoy Fiziki, Vol 43, No 1, 1962, pp 256-267

The apparatus of a quantum field theory in constant curvature p-space which could be used to compute the matrix elements of any processes is proposed. The theory is formulated in elliptical p-space which corresponds to the Euclidean formulation of the usual theory. All the expressions encountered in the theory are finite. The Schwinger equation for Green's function is generalized. Some features of the theory connected with the noncommutativity of the displacement operation in constant curvature space are examined.

116. Solution of System of Linear Algebraic Equations

"Solution of a System of Linear Algebraic Equations,"  
 by K. A. Kasymov; Alma-Ata, Izvestiya Akademii Nauk  
Kazakhskoy SSR. Seriya Matematiki i Mekhaniki,  
 No 10 (14), 1962, pp 17-20

A solution is given for a system of linear algebraic equations with real coefficients.

117. Rings With Finite Layers

"Rings With Finite Layers," by V. I. Shneydmyuller (deceased), Moscow, Uspekhi Matematicheskikh Nauk, Vol 17, pp 181- 185

In this paper five theorems are proved relating to rings:

1. A finite ring K with infinite layers cannot contain infinitely many direct sums with primary additive groups belonging to one and the same prime number p.

2. An additive group of a ring K with finite layers is the direct sum of groups of order  $p^n$  and groups of type  $p^\infty$ ; moreover, nearly all direct sums are cyclic of order p.

3. A ring of residues  $K/J$ , where J is the lower layer of K, is locally finite.

4. Any nonassociative ring K with an additive p-group of finite layers satisfies the condition of minimality for subrings.

5. An alternate ring with conditions of minimality and maximality for subrings is finite.

Submitted for publication 31 May 1960.

118. Finite Groups

"Generalization of Some Theorems on Finite Groups" (presented by Academician V. I. Krylov, Academy of Sciences Belorussian SSR), by R. I. Tyshevich, Belorussian State University imeni V. I. Lenin; Minsk, Doklady Akademii Nauk BSSR, Vol 6, No 8, Aug 62, pp 471-474

D. A. Suprunenko at the third All-Union Colloquium on General Algebra posed the question of the possibility of transferring known criteria for the solvability of a finite group of Ph. Hall (J. Lond. Math. Soc., 3, 98, 1928; and others) to periodic groups of matrices. In this paper, these and several other theorems on finite groups (H. Wielandt, Math. Z., 60, No 4, 407, 1954; and others) are applied to periodic groups appearing as finite solutions of locally nilpotent groups. Thus, all results obtained here are valid for periodic linear groups over a field without a characteristic.

119. Algorithmic Problems in Partially Ordered Groups

"Algorithmic Problems in Partially Ordered Groups," by V. I. Frenkel'; Moscow, Uspekhi Matematicheskikh Nauk, Vol 17, No 4 (106), Jul Aug 62, pp 173-179

The article is concerned with partially ordered groups defined by generatrices and relationships, as well as various aspects of the solutions, within such groups, of algorithmic problems.

Submitted for publication 19 April 1960.

120. Nilpotent Products and Torsion-Free Nilpotent Groups

"Nilpotent Products and Torsion-Free Nilpotent Groups," by A. L. Shmel'kin; Moscow, Sibirskiy Matematicheskiy Zhurnal, Vol 3, No 4, Jul Aug 62, pp 625-640

There are a number of natural relationships between nilpotent products and nilpotent groups. In the paper, the device of nilpotent products is used in the study of torsion-free nilpotent groups. In particular, the well-known theorem of A. I. Mal'tsev on the completion of Torsion-free locally nilpotent groups is proved again by algebraic methods.

Submitted for publication 12 December 1960.

121. Stable Distributions on a Class of Locally Compact Groups

"Stable Distributions on a Class of Locally Compact Groups," by B. M. Kloss, Moscow State University imeni M. V. Lomonosov; Moscow, Teoriya Veroyatnostey i yeye Primeneniya, Vol 7, No 3, 1962, pp 249-270

In this paper a stable distribution theory is developed for locally compact groups which possess one-to-one continuous homomorphism onto a compact group.

Submitted for publication 4 January 1960.

122. Double Interpolating Polynomials and Fourier Series

"The Relation Between Certain Upper Limits in the Theory of the Summation of Double Interpolating Polynomials and Fourier Series (presented by Academician A. V. Pogorelov, Academy of Sciences by V. G. Ponomarenko, Dnepropetrovsk Agricultural Institute; Kiev, Doklady Akademii Nauk Ukrainskoy SSR, No 7, 1962, pp 843-844

An asymptotic equation is derived relating the upper limits of the approximations on the class  $H(\alpha, \beta)$  of the functions of two variables by means of polynomials constructed on the basis of Fourier sums and interpolating polynomials respectively.

123. Theory of Recurrent Functions

"A Theory of Recurrent Function," by V. I. Zubov; Moscow, Sibirskiy Matematicheskiy Zhurnal, Vol 3, No 4, Jul/Aug 62, pp 532-560

In the paper, the general properties of recurrent functions are studied, and a class of recurrent functions having the property of ergodicity is constructed. This construction is based on a generalization of a theorem of Kronecker concerning the simultaneous solution of a system of inequalities.

124. Kernel of Cauchy-Type Integral

"Kernel of a Cauchy-Type Integral on Closed Riemann Surfaces," by S. Ya. Gusman and Yu. L. Rodin; Moscow, Sibirskiy Matematicheskiy Zhurnal, Vol 3, No 4, Jul Aug 62, pp 527-531

The author suggests a general method of constructing a kernel of a Cauchy-type integral and studies the algebraic properties of the kernel. The terminology and symbols are borrowed from a monograph by M. Schiffer and D. C. Spencer ("Functionals on Finite Riemann Surfaces," IL, Moscow, 1957).

125. Singular Lineals in Spaces With Arbitrary Hermitian-Bilinear Metrics

"Singular Lineals in Spaces With Arbitrary Hermitian-Bilinear Metrics," by I. S. Iokhvidov; Moscow, Uspekhi Matematicheskikh Nauk, Vol 17, No 4 (106), Jul Aug 62, pp 127-133

Several theorems are proved for singular lineals: (1) for an infinite-dimensional space with a nondegenerate indefinite metric, (2) the necessary and sufficient conditions for a definite lineal in a space with a nondegenerate indefinite metric to be singular, and (3) the necessary and sufficient conditions for a singular lineal to be complete with respect to the averages  $|x| = [x, x]^{1/2}$ .

Submitted for publication 13 December 1960.

126. Extendability of Linear Bounded Operator

"The Single-Valued Analytic Extendability of the Resolvent of a Linear Bounded Operator," by G. M. Keselman; Moscow, Uspekhi Matematicheskikh Nauk, Vol 17, No 4 (106), Jul Aug 62, pp 135-139

Given a linear operator  $T$  in Hilbert space, its resolvent, and the resolvent set, the author determines several sufficient conditions for which the existence of interior points in a set of eigenvalues of the operator leads to the operator's multivalued extendability.

Submitted for publication 5 February 1960.

127. Convergent Sequences of Linear Operators

"Convergent Sequences of Linear Operators," by P. P. Korovkin; Moscow, Uspekhi Matematicheskikh Nauk, Vol 17, No 4 (106), Jul Aug 62, pp 147-152

Linear operators of the form  $\Phi(f) = \int_a^b f(x) d\Phi(x)$ , continuous in the interval  $a \leq x \leq b$ , are considered. Several theorems are proved for the validity and convergence of these operators. The relations between these functions and a Tchebycheff system are indicated.

Submitted for publication 24 March 1960.

128. Index of Error of Differential Operators

"Index of Error of Differential Operators," by F. A. Neymark; Moscow, Uspekhi Matematicheskikh Nauk, Vol 17, No 4 (106), Jul Aug 62, pp 157-163

S. A. Orlov ("Index of Error of Linear Differential Operators," DAN 92, No 3, 1953) investigated an even-order differential equation with analytic coefficients, of the form

$$(p_\eta - \lambda)y - \frac{d}{dx} [p_{\eta-1}\frac{dy}{dx} - \frac{d}{dx} [p_{\eta-2}\frac{d^2y}{dx^2} - \cdots - \frac{d}{dx} (p_1\frac{d^{\eta-1}y}{dx^{\eta-1}} - \frac{d}{dx} (p_0\frac{d^\eta y}{dx^\eta}))]] = 0.$$

Assuming certain limitation, he established conditions for the maximum number of linearly independent solutions. In this paper, the same results are obtained with lesser limitations.

Submitted for publication 20 June 1960.

129. Holonomic, Strongly Minimal Surfaces

"Holonomic, Strongly Minimal Surfaces," by D. V. Beklemishev; Moscow, Matematicheskiy Sbornik, Novaya Seriya, Vol 57 (99), No 4, Aug 62, pp 493-516

The paper is concerned with a subclass of minimal surfaces of  $m$  dimensions as closely connected with complex analytic functions of  $n$  variables as minimal surfaces in three-dimensional space are with functions of one complex variable. These surfaces necessarily have an even number of variables  $m = 2n$ .

The following subjects are covered: (1) areal reference plane in a complex affine space; (2) basic equations for complex analytic surfaces; (3) projection of complex analytic surfaces; (4) properties of harmonic surfaces; (5) canonization of a reference frame; (6) holonomic, strongly minimal surfaces; (7) generalization of the equations of Weierstrass; and (8) the family of associated holonomic, strongly minimal surfaces.

### 130. Principle of Archimedes and Partially Ordered Factor-Lineals

"Conditions for the Feasibility of the Principle of Archimedes in Partially Ordered Factor-Groups and Factor-Lineals," ..  
by A. I. Veksler; Moscow, Matematicheskiy Sbornik. Novaya Seriya, Vol 57 (99), No 4, Aug 62, pp 477-492

Given that  $X$  is a partially ordered group and  $N$  is a normal subgroup  $X^{**}$  (corresponding to the normal sublineal of  $X$ ), the author considers the factor-group  $X/N$  (factor-lineal  $X/N$ ) and defines in  $X/N$  a partial ordering in the following manner: If  $\tilde{x} \in X/N$ , then by definition  $\tilde{x}$  is some class of elements  $x$  in  $X$ ;  $\tilde{x}$  is considered to be greater than zero if and only if there is found an  $x \in \tilde{x}$ , such that  $x > 0$  and  $x \notin N$ .

The remainder of the article is concerned with the conditions that are necessary to impose on  $N$  in order that the principle of Archimedes be feasible in  $X/N$ .

III. CONFERENCES

131. Polish Conference on Nuclear Energy

"Weekly Review"; Warsaw, Przeglad Techniczny, No 28,  
15 Jul 62 p 2

Problems of nuclear reactor construction in Poland were the topic of discussion at a recent joint session of the State Council and the Committee for Peaceful Uses of Nuclear Energy of the Polish Academy of Sciences.

Work on construction of the first Polish atomic power plants is planned for about 1975, and of nuclear power plants with a combined power of 800 megawatts and producing approximately 6 billion kilowatt-hours by 1980.

A nuclear research center to work on atomic powered ships is to be opened in Gdansk during the next 5-year plan.

132. Recent Soviet Conferences in Spectroscopy

The conferences listed below were reported in recent issues of Soviet periodicals. Included in the listing are the date and location of the conference, sponsoring organizations, and source.

a. Twelfth Annual Conference on Nuclear Spectroscopy; 26 January-2 February 1962, Leningrad. (Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, No 8, 1962, entire issue, continued from issue No 2, 1962)

b. Fourteenth Conference on Spectroscopy; 5-12 July 1961, Gor'kiy; sponsored by the Commission on Spectroscopy of the Academy of Sciences USSR. (Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, No 7, 1962, entire issue)

\* \* \*

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Central Intelligence Agency

A subject line is not required.

7 September 2004

Ms. Roberta Schoen  
Deputy Director for Operations  
Defense Technical Information Center  
7725 John J. Kingman Road  
Suite 0944  
Ft. Belvoir, VA 22060

Dear Ms. Schoen:

In February of this year, DTIC provided the CIA Declassification Center with a referral list of CIA documents held in the DTIC library. This referral was a follow on to the list of National Intelligence Surveys provided earlier in the year.

We have completed a declassification review of the "Non-NIS" referral list and include the results of that review as Enclosure 1. Of the 220 documents identified in our declassification database, only three are classified. These three are in the Release in Part category and may be released to the public once specified portions of the documents are removed. Sanitization instructions for these documents are included with Enclosure 1.

In addition to the documents addressed in Enclosure 1, 14 other documents were unable to be identified. DTIC then provided the CDC with hard copies of these documents in April 2004 for declassification review. The results of this review are provided as Enclosure 2.

We at CIA greatly appreciate your cooperation in this matter. Should you have any questions concerning this letter and for coordination of any further developments, please contact Donald Black of this office at (703) 613-1415.

Sincerely,

*Sergio N. Alcivar*

Sergio N. Alcivar  
Chief, CIA Declassification Center,  
Declassification Review and Referral  
Branch

Enclosures:

1. Declassification Review of CIA Documents at DTIC (with sanitization instructions for 3 documents)
2. Declassification Status of CIA Documents (hard copy) Referred by DTIC (with review processing sheets for each document)

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## Processing of OGA-Held CIA Documents

The following CIA documents located at DTIC were reviewed  
by CIA and declassification guidance has been provided.

OGA Doc ID	Job Num	Box	Fltr	Doc	Doc ID	Document Title	Pub Date	Pages	Decision	Proc Date
AD0333357	78-03117A	187	1	24	4083	Scientific Information Report Organization And Administration Of Soviet Science (6)	12/4/1962	94	Approved For Release	3/29/2004
AD0333955	78-03117A	190	1	20	4197	Scientific Information Report Organization And Administration Of Soviet Science (7)	1/15/1963	100	Approved For Release	3/29/2004
AD0334986	78-03117A	194	1	1	4341	Scientific Information Report Organization And Administration Of Soviet Science (8)	3/5/1963	129	Approved For Release	3/29/2004
AD0335307	78-03117A	196	1	2	4421	Scientific Information Report Organization And Administration Of Soviet Science (9)	3/19/1963	85	Approved For Release	3/29/2004
AD0336305	78-03117A	199	1	14	4550	Scientific Information Report Organization And Administration Of Soviet Science (10)	4/24/1963	99	Approved For Release	3/29/2004
AD0337360	78-03117A	203	1	2	4702	Scientific Information Report Organization And Administration Of Soviet Science (11)	6/13/1963	65	Approved For Release	3/29/2004
AD0338686	78-03117A	205	1	41	4816	Scientific Information Report Organization And Administration Of Soviet Science (12)	7/18/1963	67	Approved For Release	3/29/2004
AD0342004	78-03117A	208	1	24	4913	Scientific Information Report Organization And Administration Of Soviet Science (13)	8/21/1963	89	Approved For Release	3/29/2004
AD0343882	78-03117A	211	1	15	5033	Scientific Information Report Organization And Administration Of Soviet Science (14)	9/24/1963	127	Approved For Release	3/29/2004
AD0343989	78-03117A	213	1	12	5111	Scientific Information Report Organization And Administration Of Soviet Science (15)	10/18/1963	58	Approved For Release	3/29/2004
AD0345283	78-03117A	215	1	21	5180	Scientific Information Report Organization And Administration Of Soviet Science (16)	11/18/1963	61	Approved For Release	3/29/2004
AD0344526	78-03117A	217	1	34	5255	Scientific Information Report Organization And Administration Of Soviet Science (17)	12/24/1963	32	Approved For Release	3/29/2004
AD0347731	78-03117A	222	1	6	5419	Scientific Information Report Organization And Administration Of Soviet Science (19)	2/27/1964	53	Approved For Release	3/29/2004
AD0332259	78-03117A	182	1	34	3907	Scientific Information Report Physics And Mathematics (21)	10/8/1962	58	Approved For Release	3/29/2004
AD0332752	78-03117A	184	1	24	3975	Scientific Information Report Physics And Mathematics (22)	11/1/1962	57	Approved For Release	3/29/2004
AD0333426	78-03117A	187	1	31	4090	Scientific Information Report Physics And Mathematics (23)	12/6/1962	38	Approved For Release	3/29/2004
AD0333956	78-03117A	189	1	33	4171	Scientific Information Report Physics And Mathematics (24)	1/8/1963	38	Approved For Release	3/29/2004
AD0334380	78-03117A	192	1	4	4260	Scientific Information Report Physics And Mathematics (25)	1/31/1963	53	Approved For Release	3/29/2004
AD0335121	78-03117A	195	1	3	4384	Scientific Information Report Physics And Mathematics (26)	3/14/1963	71	Approved For Release	3/29/2004